OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME 44, NO. 9
APRIL 25, 1955

AMERICAN DYESTUFF REPORTER

Devoted to Textile Chemistry
BLEACHING • DYEING • PRINTING • FINISHING

You Haven't Seen This Yet!

A **BRIGHT GREEN** *for*
Wash-fast Cottons and Rayons

Cuprophenyl Green BL is an attractive self-shade which changes very little under artificial light. It greatly increases the range of shades that can be produced with the Cuprophenyls... an outstanding series of aftertreated direct dyestuffs noted particularly for exceptional wet fastness.

Sea Crystal . . . Venetian Bronze . . . Capri Olive . . . French Lime... and other fashion shades of green with excellent fastness to washing, water bleeding, perspiration and wet or dry cleaning are obtained economically with the *new*

CUPROPHENYL GREEN BL*

The wet fastness achieved with this unique Geigy dyestuff on cottons and rayons is *superior to developed colors* . . . but *processing time is considerably shorter*. Light fastness is good, too, and it is improved by creaseproof finishing.

Samples and Bulletin 69-G are now available.

"Cuprophenyl" is a Geigy Registered Trademark
**Patent applied for*

GEIGY DYESTUFFS
DIVISION OF GEIGY CHEMICAL CORPORATION
89-91 BARCLAY STREET, NEW YORK 8, NEW YORK

Geigy *dyestuff makers since 1859*

BRANCH OFFICES: BOSTON • CHARLOTTE, N. C. • CHICAGO • LOS ANGELES • PHILADELPHIA
PORTLAND, ORE. • PROVIDENCE • TORONTO • IN GREAT BRITAIN: The Geigy Co., Ltd., Manchester

PERMALENE® A F

A SUPERIOR INHIBITOR WHICH COMBINES DURABLE PROTECTION AGAINST ATMOSPHERIC GASES WITH A MINIMUM OF YELLOWING AND SHADE CHANGE

developed by research, proved by performance,
PERMALINE A F:

- ★ *Produces stable emulsions—without additional emulsifiers*
- ★ *Exhausts uniformly with the dyestuff in the same bath*
- ★ *Provides protection against atmospheric gas fading — fast to washing and dry cleaning*
- ★ *Holds yellowing and shade changing to an absolute minimum*

WRITE FOR TECHNICAL BULLETIN ON PERMALINE A F

Manufacturing Chemists **Refined PRODUCTS CORPORATION** Lyndhurst • New Jersey

TEXTILE DIVISION REPRESENTATIVES

Southern: CAROLE-MOSS CORP., 2511 Lucena Street, Charlotte 6, N. C.
New England: AMERICAN CHEMICAL & SOLVENT CO., 15 Westminster St., Providence 3, R. I.
California: SIDNEY SPRINGER, 311 S. San Pedro St., Los Angeles 13, California
New York: CAROLE-MOSS CORP., 451-453 Washington St., N. Y. 13, N. Y.
Canadian: RELIABLE CHEMICAL PRODUCTS CO., 85 Cannon St., W., Hamilton, Ontario
Central Eastern: ADVANCED PRODUCTS CORPORATION, New Hope, Pennsylvania
European: CHEMITALIA-CALABRI, Corso Venezia, N. 56, Milano, Italy

INDUSTRIAL DIVISION REPRESENTATIVES

New England: AMERICAN CHEMICAL & SOLVENT CO., 15 Westminster St., Providence 3, R. I.
Midwestern: UEBEL CHEMICAL CO., 410 N. Michigan Ave., Chicago 11, Illinois
Midwestern (Detroit Area): R. A. WILLINGANZ, 295 East Ann St., Ann Arbor, Michigan
Southwestern: RELIANCE CHEMICALS CORP., 2437½ University Blvd., Houston 5, Texas
Canadian: CHARLES ALBERT SMITH LIMITED, 396 Eastern Avenue, Toronto, Canada
So. California: CHEMICAL-ADDITIVES CO., 3155 Leonis Boulevard, Vernon 58, California
No. California: WILLIAM C. LOUGHLIN & CO., 311 California St., San Francisco 4, Calif.

Now is the time to consider how you can spruce up your back to school wear with new

*LENRA DYES

for

†ARNEL
TRIACETATE

As Arnel begins to go places, A.A.P. proudly presents its new **LENRA DYES,** a selected group of disperse type colors designed to help you make the most of the outstanding properties of this exciting new fiber. To start off right with Arnel, start with the research-proved colors which help keep Arnel washable and are stable to the heat setting conditions which make Arnel wrinkle-resistant and glaze-resistant.

Intensive tests by the A.A.P. research laboratory have demonstrated the all-around suitability of **LENRA** colors for the dyeing and printing of Arnel. Available in a wide range of brilliant and beautiful shades, the **LENRA** group offers excellent fastness to washing... light... and sublimation.

Many of the **LENRA** colors are presently being used satisfactorily by Celanese Corp. of America, the makers of Arnel Triacetate fiber.

For full details and working samples, consult our nearest branch. An informative A.A.P. manual on the dyeing of Arnel is available. We invite you to request a copy now.

*Trade Mark Reg. Pending
†Trade Mark

AAP

AMERICAN ANILINE PRODUCTS, INC.

WATER REPELLENT NEWS FOR MILLS, FINISHERS, MANUFACTURERS, MERCHANTS!

A new, one-package, super-silicone for woolens needing no catalyst, mixing, or curing!

Manufacturers of woolens, finishers of woolens, manufacturers of woolen garments, and all you merchants who sell them, will find this good news—

You can now have a super-silicone water repellent for woolens, worsteds, and worsted and Dacron blends with these new features—

It comes in one package; hence no mixing is needed; just add water. No catalyst is required, and no curing. The fabric is dried, and then the water repellent self-cures at 200 to 240 degrees F. in a matter of 5 to 6 minutes.

Results?

A fabric with a superlative hand; the wool actually is up-graded.

A durable water repellency meeting the most rigorous tests.

High resistance to non-oily spots and stains.

Exceptional resistance to wear.

You have been hearing so much of late about magic, wonder-working silicones of all sorts—and particularly about silicones for woolens—that we don't expect you to turn handsprings on hearing about this. We suggest something more rational—just telephone and ask us to show our stuff (the code number is "*Cravenette* WSR"). We will come on the double-quick. Or if you have a favorite finisher, call him.

Keep in mind, too, this extra feature of all "*Cravenette*" water repellents—a tag and label that have the good will of buyers everywhere.

Your Fabric treated with

Cravenette

TRADE MARK

WATER REPELLING PREPARATIONS

SHEDS SHOWERS

"CRAVENETTE" is a trademark of The Cravenette Company, U.S.A., 8th and Madison Sts., Hoboken, N. J. manufacturers and sellers of water repelling preparations. The licensed agents of The Cravenette Company, U.S.A. apply these preparations to fabrics and garments.

American Dyestuff Reporter, Vol. 44, No. 9, April 25, 1955. Published every other Monday. Copyright 1955, by Howes Publishing Co., Inc., 44 E. 23rd St., New York 10, N. Y. Domestic subscription, $7.50; Canadian, $8.50; Foreign, $15.00. Effective Dec. 1, 1954 Entered as second-class matter Nov. 6, 1919, at the New York, N. Y., Post Office under the act of March 3, 1879.

A
LONG LIFE...
AND A
FAST
ONE...

SUPRALANS

FOR
WOOL
AND
NYLON

for

- unvarying reproducibility of shades
  good to very good light and wet fastness
- shorter dyeing time

The simplicity of the neutral dyeing method of application yielding level, fast shades without the aid of a leveling agent now permits wool dyers to achieve results in quality which were not possible prior to the introduction of SUPRALANS.

Better tensile strength, preservation of fibre texture, equal exhaustion properties and uniformity of shade on various types of wool are assured factors which can be assumed with SUPRALANS.

A few minutes conversation with GDC technical and sales representatives will serve to convincingly explain the exceptional dyeing characteristics of SUPRALANS.

GENERAL DYESTUFF COMPANY

in this corner

new liquid Nacconol® SL

to help cut wet processing costs

On an equivalent active-ingredient basis Nacconol SL is a better money-value than most dry products. Your detergent-materials cost is less because you get more-cleaning-power-per-dollar.

and

You save on handling costs, too. Nacconol SL, being a liquid concentrate, is easy and clean to handle, requires no dissolving. You simply add water to get the desired working concentration. For complete technical data, send for Bulletin #326.

and in this corner

a handy coupon that will bring you a free sample of Nacconol SL so you can see for yourself how remarkable Nacconol SL really is.

Please send sample of Nacconol SL

NAME_____

COMPANY_____

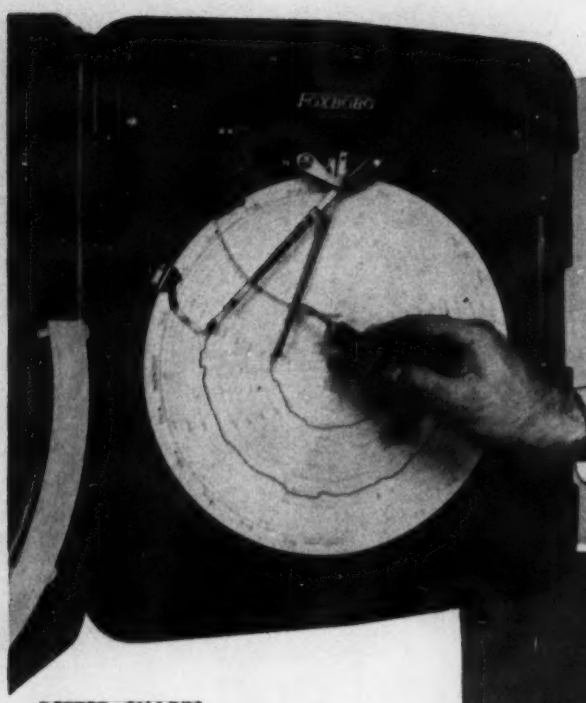
ADDRESS_____

NATIONAL ANILINE DIVISION

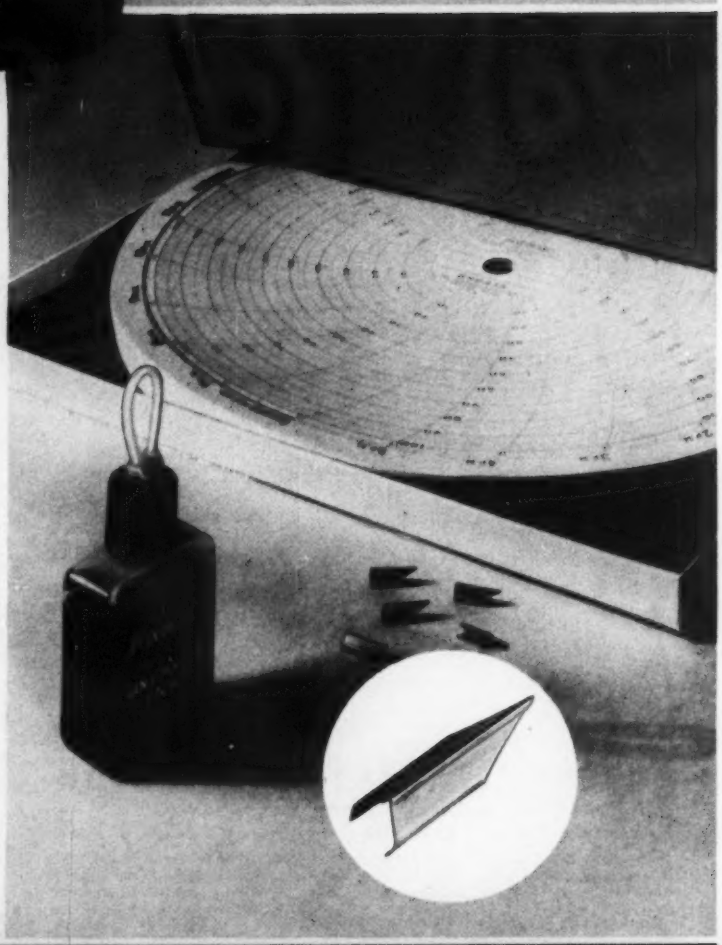
ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET, NEW YORK 6, N.Y. • HAnover 2-7300

Boston 14, Mass., 150 Causeway St. CApitol 7-0490
Providence 3, R.I., 15 Westminster St. DExter 1-3068
Philadelphia 6, Pa., 200-204 S. Front St. LOmbard 3-6382
Los Angeles 58, Cal., 4814 Loma Vista Ave. LOgan 8-2257
San Francisco 5, Cal., 517 Howard St. SUtter 1-7507
Portland 9, Ore., 730 West Burnside St. Beacon 1853
Chicago 54, Ill., The Merchandise Mart SUperior 7-3387
Charlotte 1, N.C., 201-203 West First St. Charlotte 3-9221
Richmond 19, Va., 8 North Fifth St. Richmond 2-1930
Columbus, Ga., Columbus Interstate Bldg. Columbus 3-1029
Greensboro, N.C., Jefferson Stand. Bldg. GReensboro 2-2518
Chattanooga 2, Tenn., James Bldg. CHattanooga 6-6347
Atlanta, Ga., 1216 Spring St., N. W. Elgin 0388
New Orleans 12, La., Carondelet Bldg. Raymond 7278
Toronto 2, Can., 137-143 Wellington St. W. Empire 4-6495



Better Records



BETTER CHARTS

Humitex Charts printed from high-precision plates, under controlled humidity conditions, on special, high-stability paper. Easy-to-read gray printing against chart's smooth, white background brings out full brilliance of new Foxboro Ink.

BETTER PENS

Non-corroding, stainless-steel pens with positive capillary feed. Controlled special-process points (standard and fine line) assure sharper, cleaner records.

BETTER INK

Five rich, brilliant colors . . . won't clog or "feather" . . . sediment-free . . . flows smoothly under all atmospheric conditions. Specially formulated for new Foxboro Pens and Charts.

NEW INK DISPENSER

Exclusive-design, easy-to-handle polyethylene "squeeze" dispenser (pat. pend.) gives pin-point control of drop size, ends messy pen-filling. Won't leak or break.

THE FOXBORO COMPANY
184 NORFOLK ST., FOXBORO, MASS., U.S.A.

FOXBORO REG. U.S. PAT. OFF. FOR BETTER RECORDS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

MR. KNITTER

for better knitting performance on

HELANCA® YARN

insist on your throwster using

STANTEX 1049

Helanca yarns oiled at coning with STANTEX 1049 will provide the following features that will give the knitter better results:

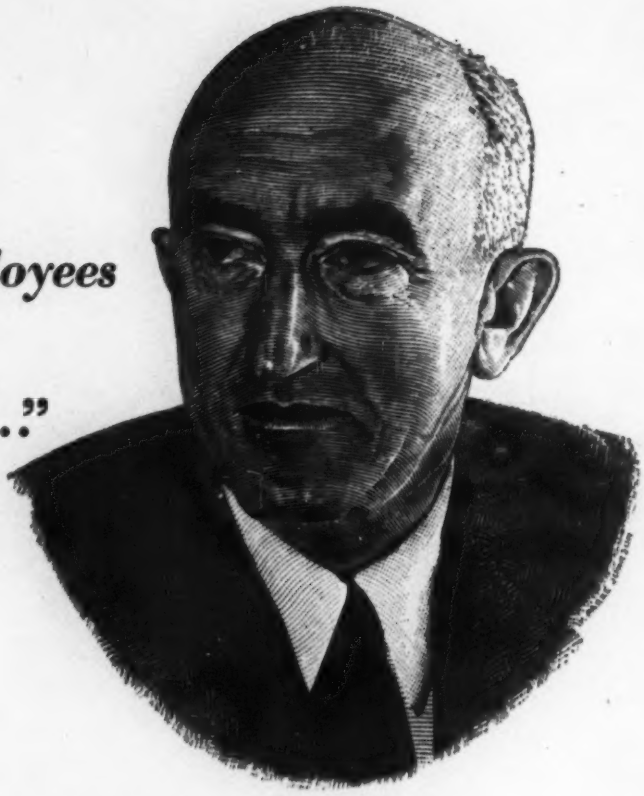
1. Proper cone formation
2. Lower yarn running tensions
3. Fluffier yarns
4. Retain proper moisture content
5. More uniform fabric
6. A clearer fabric
7. More efficient size and length control
8. Easily removed in dyeing

STANDARD CHEMICAL PRODUCTS, Inc.

HOBOKEN, N. J. · CHARLOTTE, N. C.

There is a STANTEX oil for every throwing and knitting application

"Boeing's 59,000 employees feel closer to the company..."



WILLIAM M. ALLEN
President
Boeing Airplane Company

"Boeing's 59,000 employees feel closer to the company since our recent successful person-to-person payroll savings drive in the Seattle and Wichita Divisions. Through letters and personal observations many employees have told us they have a greater sense of being a part of the company—that Boeing is interested in the welfare of each and every man and woman on the payroll."

That's the way it is with Payroll Savers. With the realization that systematic investment in U. S. Savings Bonds is a sure road to the down payment on a home, comfortable retirement, or other objectives, comes a better appreciation of a man's job and his company.

To most Payroll Savers, a day's absence from work means just that much out of his take-home savings. And he no longer takes chances, because he wants to stay off the accident list. He looks for better and quicker ways to do his job—promotion will mean more dollars for Savings Bonds. As a stockholder in America he takes a better interest in national affairs, the sound dollar, and economic stability.

91% of Boeing's 65,000 employees—more than 59,000 men and women—are Payroll Savers, as a result of a person-to-person canvass that put a Payroll Savings Blank in the hands of every Boeing employee. Certainly that is a high percentage of which Mr. Allen may well be proud. But it is not exactly unique. A number of the 45,000 companies which have the Payroll Savings Plan have 90% participation; many are in the 80% to 90% group, and many more are in the 60%, 70%, 80% class. In every case, these high percentages followed a person-to-person canvass that put a Payroll Savings Application Blank in the hands of every employee.

If less than 60% of your employees are Payroll Savers, do something about it. A phone call, telegram or letter to "Savings Bond Division, U. S. Treasury Department, Washington, D. C.," will bring prompt assistance from your State Director, U. S. Treasury Department. He will help you install, or revitalize a Payroll Savings Plan, through a simple, person-to-person canvass which your employees will be glad to conduct.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

American Dyestuff Reporter

WICASETS AND **WICALOIDS** DEVELOPMENTS OF WICA, OFFER UNLIMITED RANGE OF APPLICATION. **WICASETS** ARE EMULSION POLYMERS AND CO-POLYMERS.

WICALOIDS ARE LATEX

COMPOUNDS. BOTH ANSWER THE PROBLEMS OF THE WET

PROCESSOR OF WOVEN

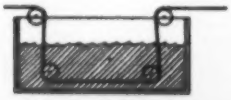
AND NON-WOVEN FABRICS (SYNTHETIC AND NATURAL) AND WARP YARNS.

WICASETS AND **WICALOIDS** ARE USED IN ROLLER COATING,

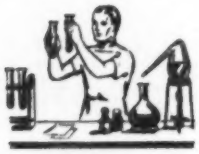
PUDDLE COATING,

SPRAY COATING,

AND IMPREGNATION.



IDEAL IN WORKING WITH FLAT GOODS AND PILE FABRICS. **WICALOIDS** ARE USED ON JUTE, SISAL, AND RAMIE PADS. WICA'S RESEARCH



DEPARTMENT WILL SUPPLY YOU WITH THE ANSWER TO YOUR PROBLEM UPON REQUEST.

Wica

WICA CHEMICALS, INCORPORATED

OLD CONCORD ROAD • CHARLOTTE, NORTH CAROLINA

THE BEST

Ciba

MICRO

VAT DYES

none®

FINED™

What is the Meaning of MICROFINED?

(over)

What is the Meaning of

MICROFINED?

The trade mark MICROFINED has been established to describe the unique characteristics such as superfine and uniform particle size and perfection of dispersion that are imparted to CIBANONE vat dyes by the original and exclusive CIBA manufacturing processes.

CIBANONE vat dyes are not just ordinary vat dyes. They are better vat dyes with distinguished qualities that are described for convenience by the word MICROFINED and are readily demonstrable in improved plant performance, trouble free continuous runs, reduction of specking on light colored goods, and better penetration of tightly woven materials. In such ways and many others CIBANONE vat dyes prove that MICROFINED is not only a word but also an effective key to happy working, superior results, profit and success.

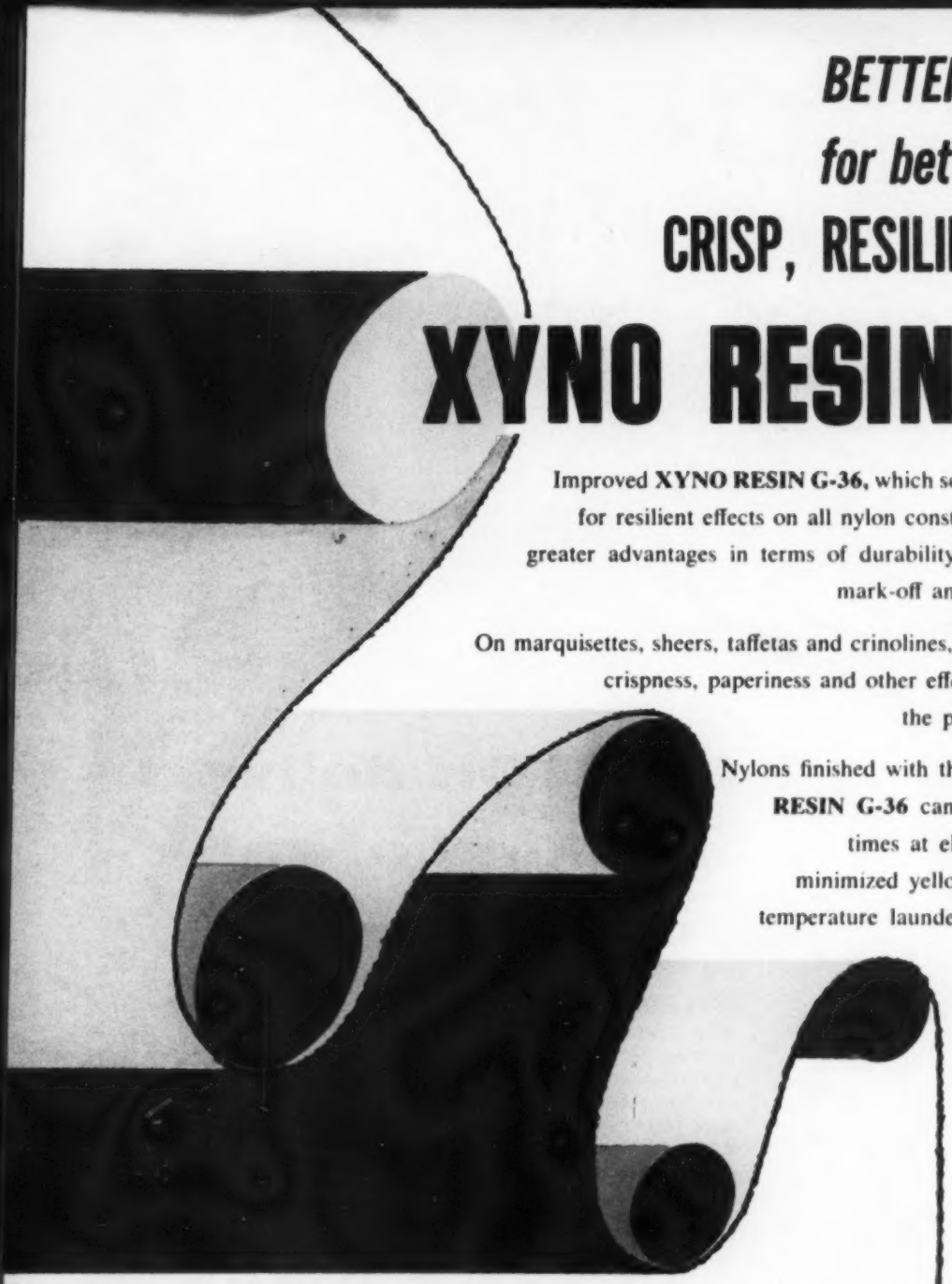
MICROPHOTOGRAPHS SHOW THE DIFFERENCE

Ordinary

MICROFINED

CIBA

pioneers in the production of fast vat dyes



BETTER THAN EVER
for better-than-ever
CRISP, RESILIENT EFFECTS

XYNO RESIN G-36

Improved **XYNO RESIN G-36,** which so long served as a standard for resilient effects on all nylon constructions, now offers even greater advantages in terms of durability, hand complete lack of mark-off and resistance to yellowing.

On marquisettes, sheers, taffetas and crinolines, all variations of stiffness, crispness, paperiness and other effects can be achieved with the proper G-36 formulations.

Nylons finished with the new, improved **XYNO RESIN G-36** can be given shorter curing times at elevated temperatures with minimized yellowing. Durability to high-temperature laundering is greatly enhanced.

For samples, specifications, suggested formulations, technical service, get in touch with Onyx today.

ONYX

OIL & CHEMICAL COMPANY

TEXTILE DIVISION

WARREN & MORRIS STS., JERSEY CITY 2, N. J.

CHICAGO • BOSTON • CHARLOTTE • ATLANTA

For Export: **ONYX INTERNATIONAL, Jersey City 2, N. J.** • *West Coast Representative:* **E. S. BROWNING CO., San Francisco, Los Angeles**

MORTON delivers any kind of salt you need—fast!

Morton makes salt for every industrial use under the sun—canning, meat packing, freeze-proofing, water softening, brine making—to mention but a few.

We can ship it to you the best possible way (roller skates are rarely used—even for small, short-distance orders) because only Morton has nine strategically located plants to serve you. And only Morton can offer fast delivery on a bag to a trainload, at favorable prices and freight, *anywhere* in the country.

Textile Men!
If you want the right kind of advice in planning a new brine installation for your plant, or in converting an old one, call on Morton. One of our Brine Specialists will help your engineers plan the most efficient and economical installation for your particular needs.

For fast delivery of the salt you need—for expert technical help, too—write, wire, or telephone this week to:

MORTON SALT COMPANY

Industrial Division, Dept. AD-4

120 South LaSalle Street, Chicago 3, Illinois • Telephone: Financial 6-1300

Pigments for color fastness!

IMPERIAL

PIGMENT SYSTEMS

For Textile Processing
Assure the Best of
Dependability, Uniformity, Economy
and Ease of Application

IMPERIAL offers

IMPrint *(aqueous printing concentrates)*

IMPad *(aqueous padding system)*

IMPac *(acetate dispersions)*

IMPerse *(aqueous dispersions for viscose and emulsion print pastes)*

Developed and made by PIGMENT COLOR DIVISION

IMPERIAL PAPER AND COLOR CORPORATION

Glens Falls, New York

Polymer Industries, Inc., Springdale, Conn.
Polymer Southern, Inc., Greenville, So. Carolina

Mathieson Chlorine: *worth its salt*

Row upon row of mercury cells characterize the uniform high purity of Mathieson chlorine. These cells decompose a salt solution by electrolysis to form a sodium amalgam and wet chlorine gas. Subsequent processes dry the gas, liquefy and cool it, resulting in chlorine approximately 99.9% pure. Above is one of five producing units from which Mathieson supplies quality chlorine to industries from Canada to the Gulf.

Consistent product quality is typical of all Mathieson chemicals. In addition, Mathieson offers consumers the protection of multi-plant production facilities . . . 3 major alkali plants, 7 sulphuric acid plants, 6 caustic soda plants, 3 ammonia plants . . . as well as practical technical assistance with chemical handling and application problems.

In planning your chemical requirements call in your Mathieson representative. Perhaps you can buy to better advantage from one of America's largest producers of basic industrial chemicals.

MATHIESON CHEMICALS
OLIN MATHIESON CHEMICAL CORPORATION
INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MD.

MATHIESON

CAUSTIC SODA • SODA ASH • CHLORINE • SULPHURIC ACID • SULPHUR • AMMONIA • NITRATE OF SODA • BICARBONATE OF SODA • NITRIC ACID • SULPHATE OF ALUMINA • SODIUM CHLORITE PRODUCTS
ETHYLENE OXIDE • ETHYLENE GLYCOL • DIETHYLENE GLYCOL • TRIETHYLENE GLYCOL • POLYGLYCOLS • DICHLORODIETHYLETHER • ETHYLENE DICHLORIDE • METHANOL • SODIUM METHYLATE • ETHYLENE DIAMINE 2622

We've followed
the textile trail
to the

DEEP SOUTH

with a
new dyestuff plant!

To bring production of Fast Colors to the doorstep of the flourishing Southern Textile Industry, we've opened an additional plant, primarily for the manufacture of naphthols, at Camp Croft, Spartanburg, S. C.

The new plant—operating with the most advanced equipment and techniques—strengthens our ability to serve the entire textile industry by providing:

Important additions to our line of naphthols
Increase in over-all productive capacity
Same-day or overnight deliveries throughout the South
Faster, broader service on customer problems

Manufacturing of Fast Color Salts and Bases continues at our Newark plant but all production in the South—including Azogen® Printing Colors and Buco Tints—will be concentrated at the Camp Croft site. Our sales representatives and technical staff will welcome the opportunity to show you how you can take advantage of our additional facilities.

Plants, Offices, Laboratories:
Newark, N. J. • Spartanburg, S. C.
Warehouses:
Chattanooga, Tenn. • Greensboro, N. C.
Charlotte, N. C. • Providence, R. I.

BLACKMAN-UHLER CO. ALLIANCE COLOR & CHEMICAL CO.

Distributed by Allied Chemical

WIESNER-RAPP
Dual Saturators

The Wiesner-Rapp Model M-8 Dual Saturators are used by leading mills for wetting out and applying finish to many types of fabrics.

They are designed to Wiesner-Rapp's high standards of engineering and are manufactured to give efficient service under hard usage.

The two pairs of squeeze rolls, 8" diameter by 50" face, consist of stainless steel bottom rolls and rubber-covered top rolls. Adapter type bearings holding the squeeze rolls are mounted in stainless steel supporting stands. Pressure to the top roll is supplied through Bendix-Westinghouse Roto-chambers, which automatically raise the top roll out of contact with the bottom roll when the air is released.

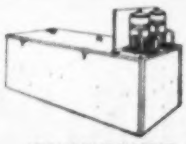
The two pad tanks are stainless steel, rigidly held between stainless steel side supports. Each tank has an immersion roll. Both tanks can be drained and the liquor level kept constant by combination plug and overflow drains.

A roll-type folder with a maximum swing of 48" and a stainless steel draw roll are mounted at the leaving end of the saturator. Other features such as expanders and drive can be included to meet customer's requirements.

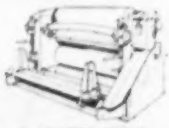
The Wiesner-Rapp technical staff will be glad to discuss features of the M-8 Dual Saturator with your personnel.

OTHER WIESNER-RAPP MACHINES

OPEN-WIDTH WASHER



SKEIN DYE KETTLE



3-ROLL PADDER

SATURATOR

THE WIESNER-RAPP CO., INC. ★ Buffalo, New York ★

THE WIESNER-RAPP CO., INC.

1615 SENECA ST., BUFFALO 10, N. Y.

Manufacturers of Textile Finishing Machinery

BUILD *Hand* ON CREASE RESISTANT FABRICS

With

SOLVITOSE HDF

Morningstar SCIENTIFIC STARCH SERVICE

SOLVITOSE HDF polymerizes with melamine formaldehyde, urea formaldehyde and modified urea formaldehyde resins.

It is essential to an improved finish!

CHECK THESE ADVANTAGES:

- ✓ **SOLVITOSE HDF** is quickly soluble in cold water.
- ✓ **SOLVITOSE HDF** will yield any desired hand to fabrics.
- ✓ **SOLVITOSE HDF** coupled with resin is durable . . outlasts repeated washings.
- ✓ **SOLVITOSE HDF** is always perfectly uniform.
- ✓ **SOLVITOSE HDF** is economical . . costs so little for the big job it does!
- ✓ **SOLVITOSE HDF** solutions do not gelatinize.
- ✓ **SOLVITOSE HDF** films are transparent.

SEND FOR FREE SAMPLES AND COMPLETE DATA, TODAY.

MORNINGSTAR, NICOL, INC.

Scientific Starch, Dextrine and Natural Gum Service

630 West 51st Street, New York 19, N. Y. • Phone: COlumbus 5-2860
1770 Canalport Avenue, Chicago 16, Illinois • Phone: CAnal 6-2219
205 W. Worthington Ave., Charlotte, N. C. • Phone: Charlotte 6-3977

Can BECCO service help you with oxidation of sulfur colors or oxidation of vat dyes?

You can ask for Becco's trained engineers and chemists to help on your dyeing range or in your laboratory.

You will find tested methods—clean, fast and simple—described in Becco bulletins on oxidation of vat dyes with hydrogen peroxide or sodium perborate; on oxidation of sulfur dyes with ammonium persulfate.

You can count on prompt delivery by tank car, truck or drum of Becco chemicals of high purity and reactive effect.

Among interesting Becco bulletins available on request are:

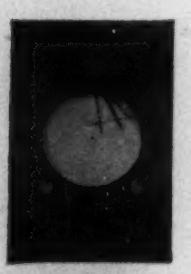
2. Hydrogen Peroxide
38. Oxidation of Vat Dyes on Cotton and Synthetics with Hydrogen Peroxide
45. Sodium Perborate
49. Ammonium Persulfate

Ask for Becco Bulletins by number.

BECCO CHEMICAL DIVISION

FOOD MACHINERY AND CHEMICAL CORPORATION

STATION B, BUFFALO 7, N.Y.
BUFFALO • BOSTON • CHARLOTTE • CHICAGO
NEW YORK • PHILADELPHIA • VANCOUVER, WASH.

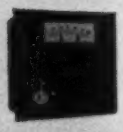


Dye Kettle Control System . . . for time-cycle control of piece goods dyeing.

Thermometer Recorders . . . single, two-pen and three-pen models.

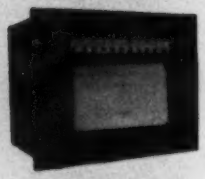
Thermometer Controllers . . . indicating and recording with electric or pneumatic control.

Portable Thermometers . . . ideal for spot recording of process temperatures.



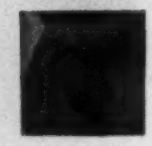
Indicating Thermometer Controller . . . economical, compact pneumatic control for temperatures from —40 to + 1000 F.

***ElectroniK* Pneumatic Controllers** . . . supplied in full range of electric or pneumatic control types.



***ElectroniK* Multi-Point Recorders** . . record up to twenty points on a single chart.

Integral Cam Programmer . . . complete time-temperature control for two separate temperatures.



***Radiamatic* Radiation-type Element** . . . detects temperature without touching fabric.

There's Brown temperature instrumentation to fit *your* mill's processes

In the complete line of Brown instrumentation for the textile industry, you'll find instruments applicable to low, intermediate and high temperatures . . . accuracies ranging from moderate to the highest precision. Control can be selected from a choice that includes simple, field-mounted indicating instruments, remote transmission systems, package-designed panels, and thoroughly automatic time-temperature program systems.

An engineering staff well experienced in the control problems of textile processes applies these instruments to the particular requirements of your own mill. To assure you of maximum continuity of operation, Honeywell's nation-wide service organization stands ready to render prompt assistance on installation or maintenance . . . by factory-trained experts spotted in more than 90 service centers.

For an answer to your specific temperature application needs, call your local Honeywell sales engineer . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● **REFERENCE DATA: Write for Bulletin 9306, "Instrumentation for Slasher Room Processes"... and for Composite Catalog No. 5000.**

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

INVENTED TO SOLVE SOME OF YOUR PROBLEMS

A NEW SERIES ORIGINATED BY AUGUSTA CHEMICAL CO AUGUSTA GEORGIA DYESTUFFS ACCO CHEMICALS ... AND PATENT APPLIED FOR*

AZOMATIC* SOLUTIONS

TRADE MARK

EASY-TO-USE, CONCENTRATED, STABLE, BASE FORMULATIONS

Just Stir into Diluted Acid

...within seconds you have a concentrated, tar-free, clear diazo solution

The following AZOMATIC SOLUTIONS are ready for shipment—*NOW!*

Others will be announced later!

SAMPLES *and* TECHNICAL DATA ON REQUEST

AZOMATIC* SOLUTIONS SAVE TIME—Because they are solutions and are ready *instantly* to produce diazos free of tar or other insoluble matter, *STRAINING IS NOT NECESSARY.*

AZOMATIC* SOLUTIONS SAVE MONEY—Because the base is *completely diazotized* when used as directed, *THERE IS NO WASTE.*

AZOMATIC* SOLUTIONS ASSURE UNIFORMITY—Because they come in *dependable, stable* concentrations and because they give uniform diazos, *SHADES CAN ALWAYS BE DUPLICATED.*

* PATENT APPLIED FOR

... and you can benefit in many other ways by using AZOMATIC* SOLUTIONS

Manufacturers of Naphthols, NAF SOL*, Accozoics, Fast Color Bases and Salts, B.O.N. and Sulfur Colors

NYANZA

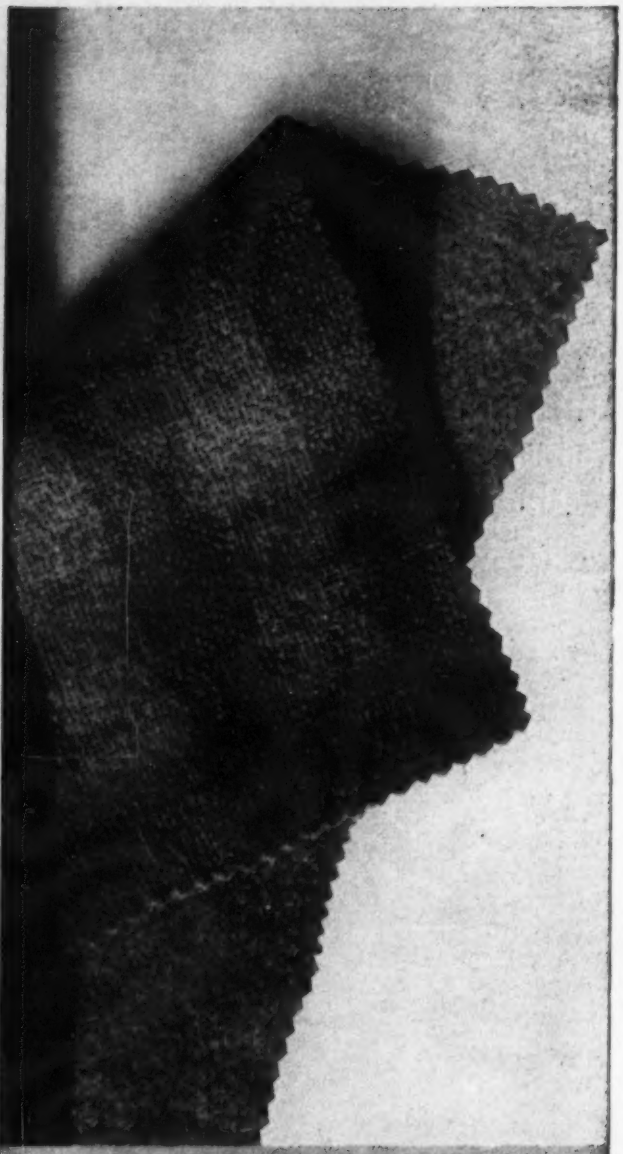
ANILINE
and
ALIZARINE
COLORS

*

TEXTILE
CHEMICALS

*

for
WOOL
COTTON
SYNTHETIC
and
MIXED
FIBERS



FACTORY AT ASHLAND MASS.

NYANZA color & chemical company, inc.

109 WORTH STREET • NEW YORK 13, N Y

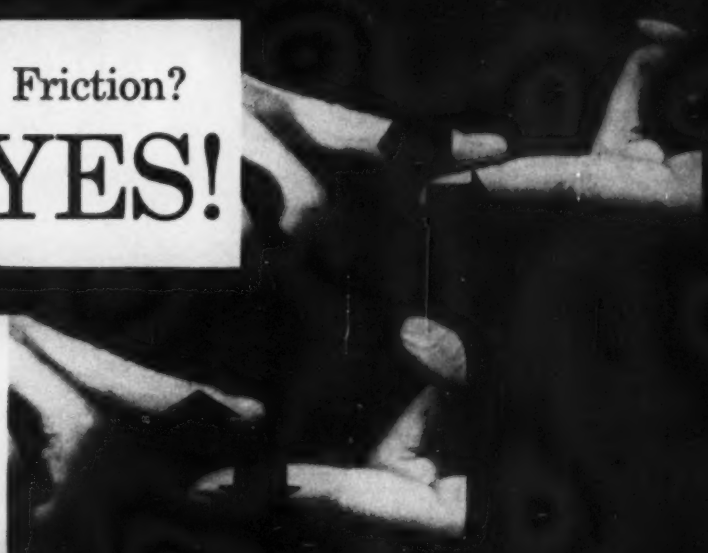
FACTORIES
CHEMICAL MANUFACTURING CO., ASHLAND, MASS. NEW BRUNSWICK CHEMICAL CO., NEWARK, N. J.

BRANCHES
549 West Randolph St CHICAGO 6, ILL. 675 Drexel Bldg PHILADELPHIA 6, PA ASHLAND, MASSACHUSETTS 115 S.W. Fourth Ave PORTLAND 4, ORE 304 E. Morehead St CHARLOTTE 3, N C

SYTON locks low-end weaves without making them "boardy"

Friction?
YES!

Tackiness?
NO!



Syton is an odorless, translucent, pH-stable silica sol for use alone or with other finishes. It deposits on fibers in millions of submicroscopic particles. They hold fibers in place, enable you to "antislip" yarns without binding them together.

Syton · Reg. U. S. Pat. Off

Delusters and improves quality of many fabrics

Perhaps you're after a low sheen (without frosting) or a dry, "worsted" hand on your fabrics. Syton can handle that, too. It works wonders with cotton, wool, synthetic fibers and blends.

Syton controls fabric distortion during finishing and in use. By varying the amount you can improve the hand of such materials as nylon marquisettes, rayon linings, satins, ribbons, rayon-wool blends, and glass fibers.

Monsanto Technical Bulletin No. I-110 tells all about Syton in textile finishing. Phone the local Monsanto representative now, or write: MONSANTO CHEMICAL COMPANY, Inorganic Chemicals Division, 710 North Twelfth Blvd., St. Louis 1, Missouri.

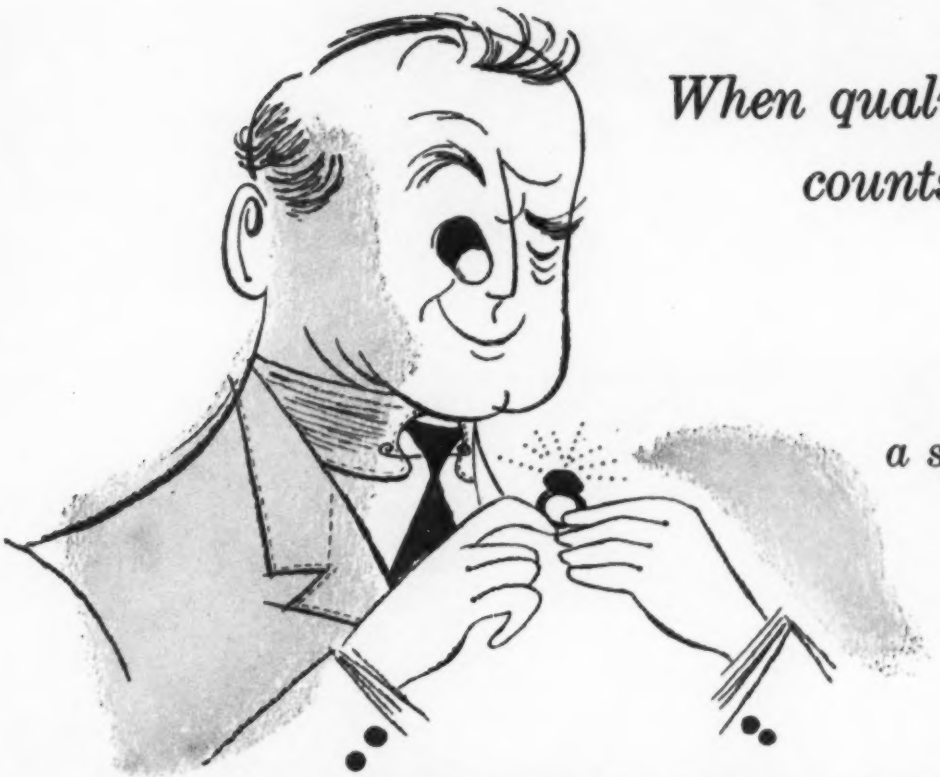
MONSANTO
CHEMICALS—PLASTICS

NAPHTOLS

B A S E S

VERONA

DYESTUFFS



When quality counts . . .

it pays to go to a specialist

WHEN QUALITY DYE PERFORMANCE COUNTS, IT PAYS TO GO TO

ALTHOUSE

Leading Specialists in Dyes for Cotton — Rayon — Nylon and Other Synthetics and **blends**

For 40 years Althouse research has pioneered in raising textile industry standards of

COLORFASTNESS

This record of leadership assures highest quality performance when you specify these famous, exclusive Althouse dye specialties:

Superlitefasts
Azoanthrenes
Supernylites
Nylanthrenes
Nydyes
Sol-Aqua-Fast

ALTHOUSE

Require versatile paste thickeners in your printing operation?

KELCO GIVES YOU THREE GOOD RIGHT ARMS

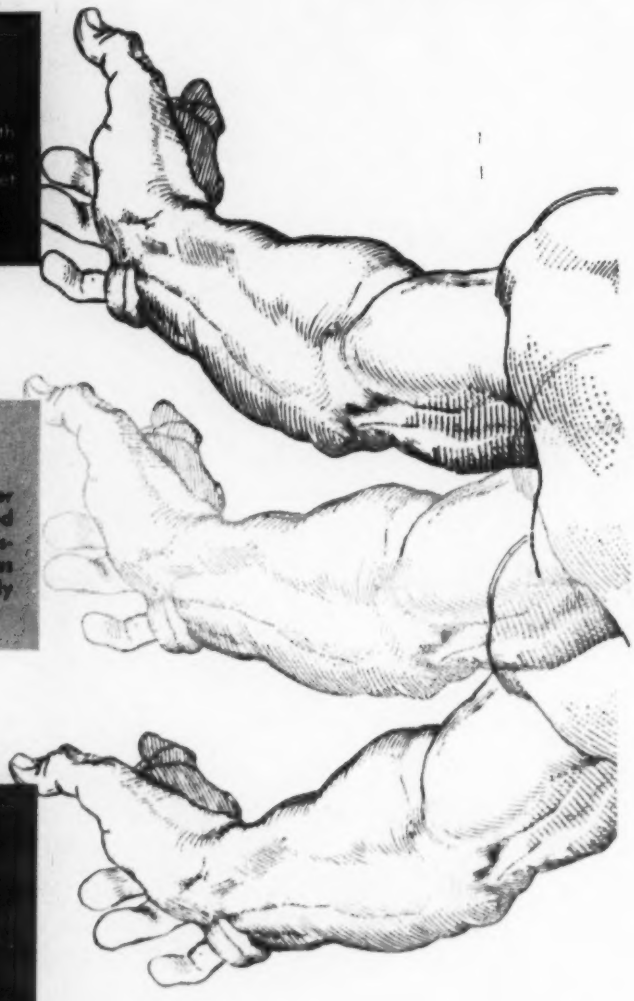
KELTONE

Extra high viscosity to give top quality performance, with substantially reduced costs. With Keltone, you prepare your print paste thickener to any desired viscosity, yet use appreciably lower gum concentrations.

KELTEX S®

Eliminates buffers, improves compatibility. Gives better stability, sharper mark and greater economy. Unmatched even in strongly alkaline print pastes without use of caustic buffers or sequestering agents. Unusually effective as surface printing gum. Improves color yield, particularly with Rapidogens, Pharmasols and Diagens.

KELTEX



KELCO print paste thickeners, produced from domestic sources, are manufactured to absolutely uniform standards. Kelco's 3 good right arms are ready to work for you. Call or write your nearest Kelco regional office.

KELTONE®. KELTEX S®. KELTEX® PRODUCTS OF KELCO COMPANY

120 Broadway, New York 5, N. Y.
20 N. Wacker Drive, Chicago 6, Illinois
530 W. Sixth Street, Los Angeles 14, Calif.
Cable Address: Kelcoalgin — New York

A "Baker's Dozen" in Textile Chemicals

It's an old American custom to build and hold business by giving "something extra." And Solvay's textile chemical business has been built on this sound principle.

Solvay not only supplies textile chemicals of the highest quality at the lowest prices, but gives "something extra" by extending its responsibility into the plants of its customers to assure efficient use, handling and storage of all its products.

To give its customers services not ordinarily available, Solvay maintains a separate section of its Technical Service Department devoted exclusively to textiles. This special textile group has years of sound, practical working knowledge and experience in the textile industry. Their services are available without charge not only for the regular handling, storage and use of Solvay textile chemicals, but also to aid in the development of new processes and methods.

In addition, Solvay's local sales offices with their trained and experienced sales representatives give you the close personal attention that best fits your individual requirements—whether you order by the bag or in carload lots.

To get the finest in textile chemicals plus "something extra," be sure to specify Solvay when you place your next order.

SODA ASH
CAUSTIC SODA
LIQUID CHLORINE
SODIUM NITRITE
POTASSIUM CARBONATE
(Calcined and Hydrated)

SOLVAY

SOLVAY PROCESS DIVISION
ALLIED CHEMICAL & DYE CORPORATION
61 Broadway, New York 6, N. Y.

BRANCH SALES OFFICES

Boston • Charlotte • Chicago • Cincinnati • Cleveland • Detroit
Houston • New Orleans • New York • Philadelphia • Pittsburgh
St. Louis • Syracuse

Soda Ash • SnowflakeⓇ Crystals • Potassium Carbonate • Calcium Chloride • Sodium Bicarbonate
Ammonium Bicarbonate • Cleaning Compounds • Caustic Potash • Sodium Nitrite • Caustic Soda
Ammonium Chloride • Chlorine • Monochlorobenzene • Para-dichlorobenzene • Ortho-dichlorobenzene
Chloroform • Methylene Chloride • Methyl Chloride • Carbon Tetrachloride

CARPET BACKINGS COST LESS, PERFORM BETTER WITH DRESINOL®

Carpet sizing compounds made with Hercules Dresinol reduce backing costs and materially improve wearing qualities in all types of cotton, wool, and mixed fiber carpets.

Dresinol solvent-free resin dispersions improve the "hand" of even the lowest cost carpets, provide either flexibility or stiffness as desired, improve adhesion of the backing, and increase water resistance. Dresinol is compatible with sizing compounds containing latex, starch, and pigments.

The versatility of Dresinol and its ability to aid flexibility also make it ideal in modifiers and extenders for latex-base sealers for asphalt-impregnated felt in hard-surface floor coverings.

Technical data on Dresinol are available in a recently published booklet. Write for your copy.

Industrial Chemicals—PMC Dept.

HERCULES POWDER COMPANY

INCORPORATED

903 Market Street, Wilmington 99, Del.

P155-2

NORMAN A. JOHNSON
Editor

CHARLES A. WHITEHEAD
Managing Editor

MYRON D. REESER
Business Manager

HERBERT A. STAUDERMAN
Advertising Manager

JAMES A. DOYLE
Promotion Manager

FRANK R. MURPHY
Production Manager

LILLIAN M. THOMPSON
Circulation Manager

OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

HOWES PUBLISHING COMPANY, INC.
44 E. 23rd Street, New York 10, N. Y.
C. R. Howes — Ernest S. Frankel
Norman A. Johnson
Myron D. Reeser
C. Essenbergs

AMERICAN

DYESTUFF REPORTER

Devoted to Textile Chemistry
BLEACHING • DYEING • PRINTING • FINISHING

Contents

VOLUME 44 APRIL 25, 1955 NUMBER 9

• ***Special Articles***

Comparative Solubilities of Natural and Man-Made Fibers 281
Siegfried S Praeger

A Review of Several Methods of Hydrosulfite Analysis with Special Regard to Control of Vat Dyebaths 283
A Airoldi and F Marchi

Apparatus for Treatment of Cotton Fabrics on a Laboratory Scale 288
Walter T Schreiber and Austin C F Mason

• ***Proceedings of the American Association of Textile Chemists and Cloorists***

FEATURE ARTICLES

Progress of Silicones in the Textile Industry .. P293
F L Dennett

A Study of Carriers in Dyeing Dacron Polyester Fiber P296
C L Zimmerman, J M Mecco and A J Carlino

Printing and Related Operations on Glass Decorative Fabrics P303
R F Caroselli

MISCELLANEOUS

AATCC Newsgram P290
AATCC Calendar P291
Obituary—Edwin P Johnstone P291
Activities of the Local Sections P291
Technical Program Committee Requests Papers for '55 Convention P292
Membership Applications P292
Employment Register P295
WNE Section Meeting Photos P304

• ***Departments***

Abstracts 305
News of the Trade 308
General Calendar of Coming Events 312

Copyright, 1955, Howes Publishing Co, Inc
Contents of previous issues can be found by consulting the Industrial Arts Index and the Engineering Index, Inc. at your library

When it rains - it shines!

and so do cottons and rayons dyed with

NATIONAL CARBANTHRENE® BRILLIANT VIOLET RK

DOUBLE PASTE

Rain or shine, this National bluish-violet anthraquinone vat rates exceptionally high for its wet fastness and light fastness. It's one more in a series of interesting National Vat Dyes with exceptionally good all-around fastness properties.

National Carbanthrene Brilliant Violet RK Double Paste scores high on all AATCC tests . . . produces attractive shades, alone and as a shading color . . . can be resin finished with little change of shade and no loss of fastness. It well merits a "Color-fast Vat Dye" tag at the point of retail sale!

To get better acquainted with this versatile National Vat, phone our nearest office for a shade card (Bulletin #396) and a working sample.

NATIONAL ANILINE DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

Boston Providence Philadelphia Chicago San Francisco
Portland, Ore. Greensboro Charlotte Richmond Atlanta
Los Angeles Columbus, Ga. New Orleans Chattanooga Toronto

Allied Chemical

AMERICAN
DYESTUFF REPORTER

VOLUME 44 APRIL 25, 1955 NUMBER 9

COMPARATIVE SOLUBILITIES OF NATURAL AND MAN-MADE FIBERS

SIEGFRIED S PRAEGER

Division of Bedding Laboratory
New York State Department of Labor
New York 13, N Y

INTRODUCTION

THE development of many new man-made fibers in recent years and their increasingly widespread use in various fields make it essential for textile chemists to have analytical procedures for their identification and quantitive determination. This study presents a series of solubility tests which have been found very useful in the quantitive analysis of fiber mixtures. The first part deals with two different concentrations of $ZnCl_2$ solution which give significant results. The second part deals with many solvents which allow a selective separation of fiber mixtures.

The author describes a workable basis for the detection and analysis of complicated mixtures of fibers.

Solubilities of natural and man-made fibers in various solvents are determined and tabulated so that the proper solvents can be selected in analyzing particular samples.

EXPERIMENTAL

Part I—SOLUBILITIES IN ZINC CHLORIDE

This work was initiated during the analysis of a commercial mixture of wool and Orlon fibers. The customary methods for determination of wool, such as boiling with 5% NaOH or treatment with 70% H_2SO_4, were not suitable because Orlon is largely soluble in boiling 5% NaOH and insoluble in 70% H_2SO_4. Both fibers are nitrogenous and therefore do not allow a differentiation by Kjeldahl method.

It was observed under the microscope that Orlon fibers, when stained with zinc-chlor-iodide reagent *(1)*, also called Herzberg Stain *(2)*, dissolved after several hours. The principal component in this reagent is zinc chloride.

Experiments proved complete solubility of Orlon in 66.7% $ZnCl_2$ solution at 40-45°C and insolubility of wool, thus permitting quantitative determination of wool and Orlon fibers. This method led to the examination of the behavior of other important natural and man-made fibers.

Previous work by Lundegard and Roseberry *(3)* showed insolubility of Orlon in 50% $ZnCl_2$ at room temperature and when heated on a steam bath.

PROCEDURE———As an aid to understanding the source of the two concentrations of $ZnCl_2$ solutions used in this work, the following description of zinc-chloride-iodide reagent as specified by ASTM *(1)* is given:

Dissolve 20g $ZnCl_2$ in 10 ml water	(solution A)
Add 2.1g KI and 0.1g iodine in 5 ml water	(solution B)
"A" contains	66.7% $ZnCl_2$
(A + B) contains without KI + I	57.1% $ZnCl_2$

These two concentrations revealed surprising differences in regard to solubilities of fibers (see Table I).

0.200g fibers were stirred constantly in 20 ml $ZnCl_2$ solution at 40-45°C for 5 min with 66.7% solution, and for 20 min with 57.1% solution. The solutions were filtered with suction through fritted glass crucibles (Corning C), washed with 5 ml of the same $ZnCl_2$ solution without or with slight suction, then twice with 20 ml HCl (diluted 1:4). The residues were then washed first with cold water and finally with hot water and dried to constant weight. The results were computed on a dry basis. Temperatures above 40-50°C were avoided to prevent changes in concentration of $ZnCl_2$ during the test period.

TABLE I
SOLUBILITY AT 40/45°C

*Type of fiber**	66.7% $ZnCl_2$ soln 5 min	57.1% $ZnCl_2$ soln 20 min
	%	%
kapok	0	0
staple cotton	4	0
bleached cotton	100	0
mercerized cotton	1	0
wood fiber (sulfite pulp)	100	5
viscose rayon	100	50
acetate	100	100
nylon	0	0
Dacron	0	0
Vinyon	0	0
Dynel	0	0
Saran	0	0
Orlon	100	0
Acrilan	100	100
Vicara	0	0
wool	0	0

* All of the man-made fibers were obtained directly from the manufacturers.

Table I shows that bleached cotton, wood fibers (sulfite pulp), and Orlon (100% acrylonitrile) are 100% soluble in 66.7% $ZnCl_2$ solution but insoluble in 57.1% $ZnCl_2$ solution. Acrilan, an acrylic fiber composed of copolymers of acrylonitrile with small amounts of other vinyl derivatives, is 100% soluble in both 66.7% and 57.1% $ZnCl_2$ solution. Therefore mixtures of Orlon and Acrilan can be determined quantitatively by using 57.1% $ZnCl_2$ solution.

TABLE II

Type of Solvent		Volume ml	Time	Temperature
water		20	1 hr	boiling
5% sodium hydroxide	(4)	20	20 min	boiling
acetone	*	20	24 hr	room
dioxane		20	24 hr	room
6N HCl	(5)	20	10 min	room
60% H_2SO_4	(6)	16	1 hr	room
70% H_2SO_4	(7)	20	15 min	38°C
90% formic acid	(8)	8	1 hr	room
100% acetic acid	(6)	10	20 min	boiling
66.7% $ZnCl_2$ } See part I		20	5 min	40-45°C
57.1% $ZnCl_2$ } See part I		20	20 min	40-45°C

* As an alternative procedure it has been found practical to put 0.200g material in the fritted glass crucible and extract it with acetone in a Soxhlet apparatus.

CONCLUSIONS

Fiber mixtures can be analyzed readily by using selective solvents. A chart showing the solubilities of fibers in various solvents gives necessary data for selecting the specific solvents after the preliminary microscopic examination has revealed the presence of the fiber types.

The use of fritted glass crucibles permits quick quantitative determination of the insoluble residues, which can be used for treatment with other solvents.

TABLE III
SOLUBILITY PERCENTAGES

Fiber	boiling water	NaOH 5%	acetone	acetone of NaOH residue	dioxane	HCl 6N	H_2SO_4 60%	H_2SO_4 70%	formic acid 90%	acetic acid 100%	$ZnCl_2$ 66.7%	$ZnCl_2$ 57.1%
kapok	4.5	34.8	0	0	2.5	5.6	35.0	98.7	3.0	6.3	0	0
staple cotton	5.0	6.0	0	0	1.5	2.5	5.7	98.4	1.5	3.0	4.2	0
bleached cotton	0	1.8	0	0	0	0	1.5	100	0	0	100	0
mercerized cotton	0.8	3.4	0	0	0	0	8.3	100	0	1.6	1.0	0
wood fiber	0	14.0	0	0	0	1.5	11.8	100	0	0	100	5.0
viscose	0	0	0	0	0	1.6	100	100	0	36.5	100	50
acetate	0	42.0	100	0	100	1.0	100	100	100	100	100	100
nylon	1.0	0	0	0	0	100	100	100	100	100	0	0
Dacron	0	4.6	0	0	0	0	0	2.0	1.0	2.0	0	0
Vinyon	0	0	100	100	100	0	0	1.7	0	1.0	0	0
Dynel	0	0	100	100	0	1.5	0	1.5	1.2	2.5	0	0
Saran	0	0	1.8	0	4.5	0	0	1.4	2.3	2.5	0	0
Orlon	1.5	67.6	1.8	0	1.8	0	3.9	4.0	4.7	3.8	100	0
Acrilan	1.0	1.7	1.0	0	0	1.5	1.0	2.5	4.8	0	100	100
Vicara	0	7.5	0	0	0	0	0	0	0	0	0	0
wool	0	100	0	..	0	0	0	0	0	0.9	0	0

Part 2—SOLUBILITIES IN VARIOUS SOLVENTS

With the ever-increasing appearance of new man-made fibers it becomes necessary to find ways to distinguish them from other fibers by their characteristics and behavior.

Microscopic observation with the help of stains usually gives the first clue to the presence of different fibers but does not allow a quantitative evaluation in fiber mixtures which are appearing more and more on the market.

Up to now the use of selective solvents has been found to be the best possible approach to analyzing fiber mixtures quantitatively. It was therefore important to extend the study of solubility of fibers as reported in Part I to other solvents. The results shown in Table III may be of interest to chemists in the field of fiber mixtures and textiles.

The determinations were made with 0.200g material. For filtration of residues fritted glass crucibles (Corning C) proved very useful, allowing quick filtration, washing, drying of residues and cleaning for reuse; if carefully handled these crucibles stay unchanged in weight. In Table II the conditions are given under which 0.200g material was treated.

The practical value of such a chart may be demonstrated in the analysis of a fiber mixture consisting of cotton, acetate, nylon and acrylic fibers.

Acetone extracted acetate fibers, 6N HCl removed nylon, and 66.7% $ZnCl_2$ dissolved acrylic fibers and acetate. Table IV specifies the results.

TABLE IV

Solvent	% dissolved	% residue	% composition
acetone	20.7 acetate	79.3 cotton, nylon, acrylic fibers	20.7 acetate
6N HCl	16.3 nylon	83.7 cotton, acetate acrylic fibers	16.3 nylon
66.7% $ZnCl_2$	39.5 acetate acrylic fibers	60.5 cotton, nylon	18.8 acrylic fibers 44.2 cotton

REFERENCES

(1) "ASTM Standards on Textile Materials", D276-49, 73 (1953).

(2) *Ibid*, D629-46T, 99 (1953).

(3) Lundegard, M and Roseberry, E D, *Am Dyestuff Reptr* 43, No. 4, 93 (1954).

(4) "ASTM Standards on Textile Materials", D629-46T, 98 (1953).

(5) Sassi, D, *Am Dyestuff Reptr* 42, No. 8, 237 (1953).

(6) "Matthews' Textile Fibers", 6th Edition, 1135 (1954).

(7) "ASTM Standards on Textile Materials", D629-46T, 95 (1953).

(8) Du Pont Technical Service 11-5, 01.

ADR Now Available on Microfilm

Arrangements are being continued with University Microfilms, 313 North First Street, Ann Arbor, Michigan, for supplying subscribers of the Reporter with a microfilm edition. This arrangement was effective with the 1952 volume. The film copy will be delivered at the end of the volume year for those who subscribe to the service and it will include all issues published during that period. It is estimated that the film edition requires only 5% of the space required for the paper edition, which is bound. Complete information is available from University Microfilms.

A REVIEW OF SEVERAL METHODS OF HYDROSULFITE ANALYSIS WITH SPECIAL REGARD TO CONTROL OF VAT DYEBATHS*

A AIROLDI and F MARCHI
Laboratorio di Chimica Tintoria dell'Instituto Industriale "P Paleocapa", Bergamo, Italy

Translated by
P J WOOD
Royce Chemical Company Carlton Hill, N J

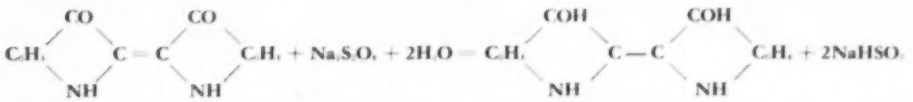
The principal object of this work was to satisfy, within the limits of possibility, a lack which the authors claim exists in industrial operation, i e, the determination of the quantity of hydrosulfite present in a vat dyebath, and to do this sufficiently rapidly to be able to control the course of the dyeing.

INTRODUCTION

THERE are many ways of analyzing hydrosulfite and, before proceeding to discuss the principal subject of this treatise, we will consider the principles, and the reasons why we have adopted some of them to control the results of which we will speak later.

1) INDIGOTIN SULFATE METHOD *(1)*——This was the first method to be employed and it is still quite extensively used, although the exactness of the results is somewhat doubtful as it is difficult to procure 100% pure indigo *(1, 2)*. Furthermore, the purification of indigo is a laborious procedure, and the subsequent sulfonation must be done under strictly controlled conditions. This method is described in nearly all the works on textile analysis; the purification of the indigo is the subject of a detailed description in a book by H Tatu *(1)*.

This method is based on the reduction of Indigotin sulfate, according to the following reaction:



262 grams pure indigo 100% correspond to 174 grams hydrosulfite 100% *(3)*.

This method is currently employed in our laboratory for the analysis of commercial hydrosulfite and also for checking analysis made by means of the gas-volumetric method, a description of which is given later.

2) IODOMETRIC OR MERRIMAN METHOD——The hydrosulfite is treated with 30% formaldehyde and allowed to stand for about 30 minutes. The formaldehyde reacts on the hydromaldehyde and sodium bisulfite formaldesulfite forming sodium sulfoxylateforhyde:

$$Na_2S_2O_4 + 2HCHO + H_2O \rightarrow NaHSO_2.HCHO + NaHSO_2.HCHO$$

In acid or neutral solution, the sodium bisulfite formaldehyde does not react with iodine which oxidizes the sodium sulfoxylateformaldehyde quantitatively to sodium bisulfate:

$$NaHSO_2.HCHO + 2H_2O + 2I_2 \rightarrow NaHSO_4 + HCHO + 4HI$$

One gram-molecule of hydrosulfite corresponds to 4 gram-atoms of iodine.

The titration can be carried out in acid bath (acetic acid) *(5)*, or in neutral solution *(3, 4)*. In the latter case it is also possible, by titration of the acidity formed during the preceding reaction, to determine the small quantity of thiosulfate present in the hydrosulfite as an impurity.

We have used one method or the other, at different times. For the purpose of control, it is sufficient to use iodometric titration of the hydrosulfite alone.

3) AMMONIACAL COPPER SULFATE METHOD *(5)*——This method was used by us according to the technique prescribed in the method of the American Association of Textile Chemists and Colorists. It is very practical, not only for the testing of hydrosulfite, but also for evaluation of the various sulfoxylates.

The solution of hydrosulfite, as in the iodometric method, is stabilized by addition of a solution of formaldehyde; this is poured into a flask, into which is conducted a current of carbon dioxide, and titration is performed with a solution of ammoniacal copper hydroxide (made from copper sulfate and concentrated ammonium hydroxide), first in the cold and then, to complete the reduction, at higher temperatures. The end point of the titration is reached when a slight blue coloration is not discharged by ten seconds of boiling:

$$2CuSO_4 + 4NH_3 + Na_2S_2O_4 + 2H_2O \rightarrow Cu_2SO_3 + (NH_4)_2SO_4 + (NH_4)_2SO_3 + Na_2SO_4$$

Each gram of copper contained in the solution corresponds to 1.369 grams of sodium hydrosulfite. The greening of the solution, with complete oxidation of the hydrosulfite, is very sharp and, from this point of view, the method is desirable. However, it is well to make two titrations when using this procedure, the first one by way of practice.

4) BOLLENBACH METHOD *(2)*——Hydrosulfite is oxidized by ferric-ammonium sulfate, according to this equation:

$$Na_2S_2O_4 + Fe_2(SO_4)_3 + H_2SO_4 \rightarrow 2FeSO_4 + 2NaHSO_4 + 2SO_2$$

The standard solution is prepared by dissolving the ferric alum in water and standardized by the Zimmermann method (reduction of the ferric salt with stannous chloride and titration of the ferrous salt with permanganate). As an indicator, potassium sulfocyanide is used, which gives a red coloration with the ferric salt. When the red coloration changes to yellow, one or two drops of a 1% solution of indigotin sulfate is added and the titration is continued until the blue coloration disappears.

Also based on the reduction of a ferric salt to the ferrous state is a simple apparatus called the Vatometer, which was designed by the late Dr Feibelmann to check the hydrosulfite content of the vat dyebath. This is described in detail by Tatu *(1)*.

OTHER METHODS——We will simply mention some other methods: that of Knecht, which is based on the oxida-

* This article appeared originally in Italian in *Tinctoria* 51, No. 2, 43-9 (1954).

tion of the hydrosulfite with excess of potassium bichromate and subsequent volumetric determination of the precipitated chromium oxide *(2)*; the Wilks method, which depends on the oxidation of the hydrosulfite by a mixture of potassium iodide and potassium iodate *(2)*; and Orloff's method, which is based on the reaction of potassium-mercuric iodide with hydrosulfite in alkaline solution, which produces metallic mercury *(12)*. All these methods seem to us to be too laborious.

DISCUSSION

The principal object of our work was to satisfy, within the limits of possibility, a lack which exists in industrial operation, that is, the determination of the quantity of hydrosulfite present in a vat dyebath, and to do this sufficiently rapidly to be able to control the course of the dyeing.

It is evident that the methods of analysis briefly described may or may not supply this need, although all that is required is a simple form of technical control without any striving for excessive precision, and this has been our objective. The end point of a titration of hydrosulfite solution is always indicated by a change of color of the solution, sometimes rather slight, but the presence of the leuco compound, itself frequently colored, and/or its oxidation products, masks the color change, rendering it invisible or only visible with difficulty. References that we have been able to find in the technical literature regarding this question of control *(6)* seem to be limited to the use of indigotine sulfate as the titrating solution, and it is practically only applicable to vat dyebaths for very light shades, a fact which we ourselves have confirmed by many experiments we have made.

Naturally we did not overlook the possibility and importance of control of reducing power by means of determination of the oxidation-reduction potential *(7)*. However, without entering into any discussion as to the convenience or otherwise of this determination, we must state that the apparatus necessary to make a rapid determination of the redox potential is quite expensive, and for the moment, of limited application.

An example of an apparatus which seems to have met with practical application is the "Foxboro Dynalog Redox Recorder" used to control the dyebath in the Marhen continuous-vat-dyeing process *(8)*.

We thought it wise to continue our work, which started when the above-mentioned apparatus for the determination of the redox potential was not yet known, for we felt that it has the advantage of offering a method of rapid control of the hydrosulfite content of a vat dyebath by means of the facilities usually available in most dyehouses.

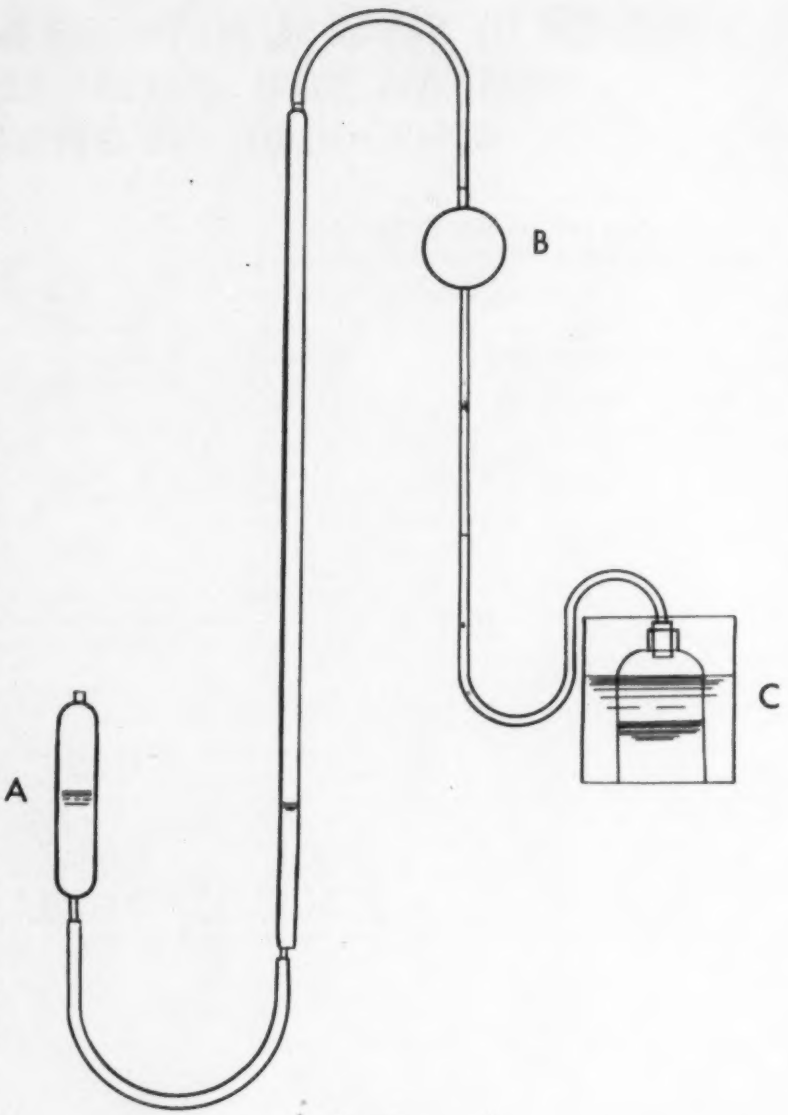


Figure 1

We cannot deny the fact that our first attempt, which was to determine the hydrosulfite by a gas-volumetric method, has not fulfilled our expectations. Nevertheless, we will give a short account as to how this method has been used as a quick and sufficiently accurate test for comparing commercial hydrosulfites.

This method is based on the supposition that sodium hydrosulfite absorbs oxygen quantitatively *(9)* and retains it, so that it should be possible, in the presence of excess of oxygen, to quantitatively oxidize the hydrosulfite in the dyebath.

As a matter of fact, a similar system was recommended some years ago, the apparatus employed being called a Reductometer or a Vatometer *(10, 11)*, but in our opinion neither the apparatus recommended nor the procedure described give reliable results. To this statement we will add a few observations, not only because the apparatus in question is of particular interest today, but because these observations have led to experiments and results of which more will be said later.

Above all, the Vatometer as constructed and used cannot give analytical results which are even roughly correct, because insufficient account has been taken of factors influencing the volume of the gas, and particularly that of temperature. For these reasons we propose, for making gas-volumetric determinations of hydrosulfite, an apparatus having the characteristics shown in Figure 1.

In the second place, the oxygen, during the determination, is not only absorbed by the hydrosulfite, but also by the leuco compound of the dyestuff. This not only influences the results, as previously mentioned, but renders unreliable any approximation of the end of the reaction; hence the results are completely misleading.

DESCRIPTION OF THE APPARATUS SUGGESTED FOR ANALYSIS———A burette filed off at both ends is connected at the lower end by a rubber tubing with a leveling bottle A, and at the upper end with a sphere having a diameter of 9 to 10 cm. The burette has a capacity of 50 ml and is graduated in tenths of a ml. The sphere is inserted into the system in order to augment the reserve of air necessary to oxidize the hydrosulfite and this is, in turn, connected to the ground glass stopper of the bottle C, having a capacity of about 250 ml.

The determination is made on 0.25 to 0.40 g hydrosulfite. The analysis is carried out by introducing into bottle C 50 ml of distilled water, containing a few drops of a foaming agent (sodium lauryl sulfate) and 5 ml of a 50% solution of caustic soda.

The bottle is immersed in a beaker of water to keep the temperature constant during the entire course of a analysis. (*Note*: the operation of the solution of hydrosulfite in water is exothermic).

The hydrosulfite is weighed in a small thin glass tube, closed at one end, and introduced into the liquid in an upright position, so that the liquid does not come into contact with the reducing agent. The leveling bottle is adjusted to that the water in the burette is in the vicinity of the zero mark. The reading is recorded. Then the bottle is shaken for 10 to 20 seconds so that the hydrosulfite is dissolved in the water, and the bottle is immersed in the cooling water again. After one minute (including the shaking period) another reading is taken. Once again the liquid is agitated for another 10 to 20 seconds, allowed to cool in the cooling water for one minute, and another reading taken. This is continued until three successive readings are practically identical. (*Note*: small differences are unavoidable, probably on account of temperature variations).

The difference between the first and last readings gives the absorbed oxygen. The volume is converted to normal temperature and pressure (760 mm at 0°C) and from this value the hydrosulfite can be calculated:

1 cc oxygen—0.0077686 g hydrosulfite 100%

Note 1

It should be noted that, in this determination, the absorption of oxygen takes place according to the equation

$$Na_2S_2O_4 + H_2O + O_2 \rightarrow NaHSO_3 + NaHSO_4$$

while atmospheric oxygen oxidizes hydrosulfite to sodium bisulfate, which is just what happens in the case of titration of hydrosulfite with iodine.

It has been observed, according to scientific tests, that oxidation of hydrosulfite takes place in two ways by the action of air, depending on whether the air is present in excess or limited in quantity. When the air is in excess, the reaction takes place according to the equation given above; when the quantity of air is restricted, the reaction takes place according to this equation:

$$2Na_2S_2O_4 + O_2 + 2H_2O \rightarrow 4NaH\,SO_3.$$

Evidently, as we operate in the presence of an excess of air and the absorption of oxygen is favored by the agitation of the liquid and the presence of the foam, our determination takes place *almost* exclusively according to the first reaction, and we assume a quantitative value. It is true that it might be more desirable, for the sake of precision, to carry out the determination in the presence of oxygen rather than air. But this would make the method too complicated for a quick control, and besides, the improvement in the results, for all practical purposes, would hardly be worthwhile.

Note 2:

The above described method has been studied further, with the idea of adapting it to the determination of the hydrosulfite in vat dyebaths. In the course of these trials, we have endeavored to discover the conditions under which it might be possible to overcome the influence of the coloring matter which, in its leuco form, absorbs oxygen.

For this reason we tried to operate in an acid bath (to separate the leuco compound from its salt), varying the pH of the bath in various directions. This was attained by operating in the presence of solutions buffered to the required pH. From the many experiments made, it seems that the best conditions for quantitative absorption of oxygen were that the ambient should be strongly alkaline (minimum alkalinity equal to N sodium hydrate solution); however, this did not eliminate the coloring matter.

It was noticed that the hydrosulfite, in aqueous solution, behaved practically like a mixture of sodium sulfoxylate and sodium bisulfite. It was necessary evidently to find out if the bisulfite or sulfite interfered with the results regarding the absorbing of the oxygen, so we carried out numerous absorption tests using bisulfite alone under various conditions of pH value. These brought out the fact that, while at a pH of 5 and below bisulfite has an appreciable absorbent effect on the oxygen, this entirely disappears in the presence of a high excess of caustic alkali.

Note 3:

It has been stated above that the amount of hydrosulfite might be varied from 0.25 to 0.40 grams. It would seem desirable to use a smaller sample, with the idea of assuring a sufficient excess of oxygen; but in this case errors in weighing might arise, and above all the influence of temperature and errors of manipulation might render the results less reliable. However, the use of a larger sample must be excluded because, in this case, the reserve of oxygen would become insufficient.

The analytical results obtained under the conditions and with the precautions as indicated came out 2% below those obtained by the iodometric method and the ammoniacal copper sulfate method. The method proposed has the advantage of being easy to perform rapidly (10 minutes), does not require preparation of standard solutions and avoids other troublesome details. It might, perhaps, serve as a rough method of manufacturing control of sodium hydrosulfite.

DETERMINATION OF THE HYDROSULFITE IN A VAT DYEBATH———As previously noted, the gas-volumetric determination described is not applicable in the presence of a vat dyestuff. Under the conditions obtaining in the dyebath that is quite alkaline, the reduced dyestuff would absorb, more or less rapidly, all of the oxygen, and the quantity absorbed would by no means be negligible in comparison with that fixed by the hydrosulfite. It may be noted, for example, that while 1 gram of hydrosulfite 100% absorbs 128 ml oxygen, a gram of reduced indigo absorbs 42.7 ml. Hence, it is evident that it is impossible to calculate the hydrosulfite from the quantity of oxygen absorbed, and the consequent impractibility of the Vatometer method previously cited *(10, 11)*.

Then we thought to try adding formaldehyde in the same way as is done in the iodometric and ammoniacal copper sulfate methods, filtering off the previously precipitated coloring matter. The results appeared to be favorable.

The procedure as finally worked out was as follows: To a portion of the dye liquor is added formaldehyde and acetic acid. In this way, the hydrosulfite is stabilized and, at the same time, the leuco compound is precipitated. Generally the leuco compound separates in a flocculent state, which is easily filtered. It is a good idea and sometimes absolutely necessary to add 1 or 2 grams of common salt in order to avoid formation of a colloidal dispersion of the leuco compound. The liquor is brought to volume and allowed to stand for a couple of minutes, then it is shaken and filtered through a dry filter paper and an aliquot of the filtrate is titrated with iodine. The whole operation does not take over 5 minutes.

In the search for the most favorable conditions for separation of the leuco compound, trials were made varying the pH of the solution. Lower pH values than are usual were used in the conventional iodometric method. Although lowering of the pH to quite low levels does not sensibly affect determination of the hydrosulfite content, we preferred to

work at a point between pH 4 and 5, always adding salt, which is particularly useful in cases where the color has any tendency to separate in colloidal form. As a result of these various trials, it was found that acetic acid must be added in at least double the stoichiometric quantity actually required to neutralize the caustic soda present.

In our experiments, we used 10 ml of 10% acetic acid. It may be stated by way of simplification that, if instead of this quantity 15 ml were used, there would be no bad effects. However, it is well not to exceed the quantity indicated by much more as experience has taught us that this may unfavorably affect the separation and filtration of the leuco compound.

The reliability of this procedure and of the data resulting from the numerous trials carried out required experimental confirmation. To decide this question the method of determination of the excess of hydrosulfite that should be theoretically present in the solution after reduction of a weighted amount of coloring matter could not be used.

Apart from the fact that only in few cases did we have perfectly pure colors at our disposal, it is evident that such close control could not be exercised because, in preparing the dyebath, there are inevitable losses of reducing power, which cannot be estimated. In addition, in order to attain the necessary redox potential for complete reduction, an excess of hydrosulfite is required which varies from color to color.

According to Dr Schaeffer's figures, which may be somewhat arbitrary but relative in value, the redox potentials listed in Table I are required for the specified colors.

From this it would seem that, for complete reduction of Indanthrene Yellow G on which we made experiments, an rH of 4 is sufficient, whereas for Khaki 2G, which corresponds to Khaki Ramantrene 2G on which we also made trials, an rH of 0.8 is absolutely necessary.

Keeping in mind the rH values of hydrosulfite solutions (see Table II), the preceding observations signify practically that, to completely reduce Indanthrene Yellow G, a reducing ambient that can be obtained with about 0.1 g/l hydrosulfite is sufficient while for Indanthrene Khaki 2G it is necessary to use about 1.0 g/l hydrosulfite. (The rH values given in Table II are those of hydrosulfite solutions at pH 11, whereas, as a matter of fact, the pH at which the reduction is carried out is much higher).

From Table I it will be noted that the rH necessary to start the reduction varies from color to color, and that there is a zone of hydrosulfite concentration in which the color is only partially reduced. This is what causes the difficulty in evaluating the state of reduction of the color,

TABLE I

REQUIRED REDOX POTENTIALS

	rH positively indispensable for complete reduction	*rH at which the color change of the bath starts to take place*
Indanthrene Golden Yellow GK	3.8	7.0
Indanthrene Yellow G	4.0	7.5
Indanthrene Yellow GF	2.4	4.5
Indanthrene Brilliant Orange GR	0.8	3.6
Indanthrene Khaki 2G	1.5	?
Indanthrene Brilliant Green FFB	1.8	1.3

and this in turn may influence the analytical results.

It was decided to check the results in the following manner:

In a bottle with a ground glass stopper, a stock solution of a vat dyebath is prepared according to the following formula:

Dyestuff	1 g
Caustic soda 40%	6 to 7 ml
Sodium hydrosulfite	0.5 to 3 g
Water	make up to 500 ml exactly

Close the bottle and place in a hot waterbath until reduction is complete. After complete reduction is attained, the excess hydrosulfite is determined by the following proposed method:

50 ml of the dyebath is pipetted into a 100 ml volumetric flask containing 20 ml formaldehyde 40%, and 10 ml acetic acid, 10%. After a pinch of salt is added, the solution is made up to volume with water, allowed to stand for a couple of minutes, then shaken and filtered through a dry filter paper. 50 ml of the filtrate is titrated with iodine (this corresponds to 25 ml of the original solution).

For each color various trials are made by preparing various dyebaths, the first of which contains the amount of hydrosulfite considered strictly necessary to completely reduce the quantity of coloring matter present in the one liter of solution. Successive trials are made in which the hydrosulfite is increased by known increments.

Let us take "p" as the exact quantity of hydrosulfite (unknown) required to reduce the color present in one liter since, even in the first dyebath, there is always an excess of hydrosulfite present. This excess we will designate by the letter "q". Hence the total amount of hydrosulfite used (including losses by oxidation by air, etc), is equal to q + p. For control of the first dyebath we need to determine the excess "p".

TABLE II

rH VALUE OF SOLUTIONS OF HYDROSULFITE AT 20°G, AND AT pH 11

Hydrosulfite g/l	*rH value*
1	0.8
0.1	4.0
0.02	7.5
0.01	7.5

In the second dyebath, we add a further calculated excess of hydrosulfite (for example, one g/1). In this case the total quantity of hydrosulfite becomes q + p + l and, since there is reason to believe that the losses incurred during preparation are the same in each bath, in the analysis of the second bath we should find the excess of hydrosulfite to be equal to p + l. If our control is exact, we should recover in the second dyebath essentially the excess of one g/l of hydrosulfite that we added. Naturally the exactness of the results, and therefore the reliability of the control, will be vitiated by inevitable errors of analysis, particularly in the sensitive iodometric titration.

Attention must also be paid to another factor which may influence the results, ie, the danger that, in using an excess of hydrosulfite, over-reduction of the color may occur, a thing which happens frequently enough with certain colors even in practical application in the dyehouse. For this reason, we have avoided using more than three times the quantity of hydrosulfite considered necessary for reduction of the dyestuff in question and have not prolonged the heating period excessively beyond that necessary to effect reduction.

In some cases the difference between the calculated excess of hydrosulfite and the excess determined by analysis can evidently be attributed to this matter of over-reduction. But it would not be right to exclude the possibility that the quantity of hydrosulfite used in the first dyebath might have been insufficient to effect complete reduction. It is easy to see that the range of rH in which the reduction takes place is quite broad.

In our trials we used various vat colors chosen at random from the collection in our laboratory. Some of these had undergone a purification and it was these which gave the best analytical results. This probably was not only because of the absence of impurities, but because of the physical state of the color acquired during purification, a state conducive to more rapid and complete reduction. The first three colors listed in Table III are examples of those used in a high state of purity.

In order to explain Table III, we will use the first color, Thioindigo, as an example. The mixture employed for re-

TABLE III

No.	Hydrosulfite used per 25 ml of soln 77.5% hydro	Hydrosulfite used per 25 ml of soln 100% hydro	Hydrosulfite used per 1000 ml of soln 100% hydro	N/10 Iodine ml per 25 ml soln	Hydrosulfite found in 25 ml of soln 77.5% hydro	Hydrosulfite found in 25 ml of soln 100% hydro	Hydrosulfite found in 1000 ml of soln 100% hydro
2g/l THIOINDIGO							
1	0.05	0.03875	1.55	0.5	0.0028	0.002176	0.0874
2	0.1	0.0775	3.10	9.05	0.0508	0.0393	1.572
Theoretical excess		0.03875	1.55	Experimental excess		0.03712	1.485
2	0.1	0.0775	3.10	9.05	0.0508	0.0393	1.572
3	0.15	0.11625	4.65	18	0.1010	0.0783	3.132
Theoretical excess		0.03875	1.55	Experimental excess		0.039	1.56
2g/l ROMANTRENE SCARLET 2G—Trial A							
1	0.05	0.03875	1.55	0.7	0.0039	0.00304	0.1216
2	0.1	0.0775	3.10	9.0	0.0505	0.03918	1.5672
Theoretical excess			1.55	Experimental excess			1.446
2	0.1	0.0775	3.10	9.0	0.0505	0.03918	1.5672
3	0.15	0.1162	4.65	17.65	0.0991	0.07682	3.0728
Theoretical excess			1.55	Experimental excess			1.506
2g/l ROMANTRENE SCARLET 2G—Trial B							
				0.7	0.0039	0.00304	0.1216
				9.3	0.0522	0.04048	1.619
				Experimental excess			1.497
				9.3	0.0522	0.04048	1.619
				17.7	0.0994	0.07704	3.0816
				Experimental excess			1.4626
2g/l ROMANTRENE KHAKI 2G							
1	0.05	0.03875	1.55	0.2	Insufficient		
2	0.1	0.0775	3.10	7.2	0.0404	0.03134	1.25
3	0.15	0.1162	4.65	18	0.0994	0.07704	3.0816
Theoretical excess			1.55	Experimental excess			1.55

Note: With 2 g/l hydrosulfite 77.5% this color was not completely reduced. A slight deposit was noted at the bottom of the flask.

4g/l INDANTHRENE YELLOW G							
1	0.1	0.0775	3.02	8.3	0.04785	0.03612	1.4448
2	0.15	0.11325	4.53	16.6	0.09571	0.07225	2.89
Theoretical excess			1.51	Experimental excess			1.445
2	0.15	0.11325	4.53	16.6	0.09571	0.07225	2.89
3	0.2	0.151	6.04	25.4	0.1464	0.11056	4.422
Theoretical excess			1.51	Experimental excess			1.53
4g/l ALGOL YELLOW GC							
1	0.1	0.0775	3.02	11.4	0.06573	0.04962	1.985
2	0.15	0.11325	4.53	19.85	0.1144	0.08642	3.45
Theoretical excess			1.51	Experimental excess			1.473
2			4.53	19.85			3.457
3	0.2	0.151	6.04	27.85	0.1606	0.1212	4.849
Theoretical excess			1.51	Experimental excess			1.392

Note: The experimental excess which is markedly lower than the theoretical excess, is probably an indication of over-reduction of the dyestuff.

4g/l INDANTHRENE YELLOW 7GK							
1	0.15	0.11325	4.53	18.55	0.1069	0.08094	3.23
2	0.2	0.151	6.04	26.4	0.1527	0.1153	4.612
Theoretical excess			1.51	Experimental excess			1.38
4g/l CIBANONE GOLDEN YELLOW RK							
1	0.05	0.03775	1.51	1.4	0.00866	0.006538	0.2615
2	0.10	0.0755	3.02	9.3	0.05295	0.03996	1.5984
Theoretical excess			1.51	Experimental excess			1.34
4g/l BRILLIANT INDANTHRENE VIOLET RR—Trial A							
1	0.1	0.0753	3.02	5.5	0.0317	0.02393	0.9572
2	0.15	0.11325	4.53	13.2	0.0761	0.05745	2.298
Theoretical excess			1.51	Experimental excess			1.34
2	0.15	0.11325	4.53	13.2	0.0761	0.05745	2.298
3	0.2	0.151	6.04	21.1	0.1217	0.09188	3.6752
Theoretical excess			1.51	Experimental excess			1.377
4g/l BRILLIANT INDANTHRENE VIOLET RR—Trial B							
2				18.1	0.1043	0.07879	3.152
3				26.35	0.1519	0.1146	4.584
				Experimental excess			1.43
16g/l CARBANTHRENE BLUE BCF DOUBLE PASTE							
1	0.10	0.0755	3.02	6.2	0.03574	0.02698	1.0792
	0.15	0.11325	4.53	14.1	0.0813	0.06138	2.4552
Theoretical excess			1.51	Experimental excess			1.376

duction contained 77.5% actual hydrosulfite, and various amounts were used for the different colors. In the second column is shown the amount of hydrosulfite used in 25 ml of solution. The third column shows these figures converted into hydrosulfite of 100% strength. Multiplying this value by 40 gives the amount of 100% hydrosulfite contained in 1 liter (fourth column).

In experiment No. 1, we prepared the dyebath with the quantity of hydrosulfite indicated, then proceeded to determine the excess of hydrosulfite over and above the amount required for reduction of the Thioindigo, by the method described, titrating 25 ml of the hydrosulfite-formaldehyde mixture with N/10 iodine. This required 0.5 ml of N/10 iodine (fifth column), which corresponds to 0.0028 g of 77.5% hydrosulfite (sixth column) or 0.001176 g of 100% hydrosulfite (seventh column). On the basis of grams per liter, this is equal to 0.08704 g of 100% hydrosulfite (eighth column).

In trial No. 2, the quantity of 77.5% hydrosulfite used was increased to 4g per liter. The theoretical excess of hydrosulfite, in grams per liter, calculated from trial No. 1, in terms of 100% hydrosulfite, becomes 3.10—1.55 g. By iodometric analysis we found in this dyebath 1.572 g hydrosulfite. The excess of hydrosulfite found experimentally would therefore be 1.572—0.08704 or 1.485 g/l.

It is evident, after taking into consideration the possibilities of error previously pointed out, that the agreement between the theoretical excess of hydrosulfite and the excess determined by experiment is excellent. As a matter of fact, a loss of 65 mg of hydrosulfite per liter in practice is negligible.

Tests were also made with other colors such as Indigo, Algol Violet R, Indanthrene Khaki 2G, Indanthrene Red RK, Indanthrene Olive R, etc, with quite satisfactory results on the whole.

Where the results were not too regular, there is reason to believe that this may depend wholly or in part on the physical condition of the coloring matter, which may render reduction of the color difficult or very slow.

As for the remainder, as has been stated, the carrying out of trials on various types of colors, especially with the micropowders, will prove the practicality and reliability of this proposed method.

Here is the exact method as used in practical work:

20 to 30 ml 36-40% formaldehyde are put into a 100 ml volumetric flask, together with the quantity of 10% acetic acid necessary to give the required pH. For this purpose 10 ml of acid is used in the baths of lower alkalinity (methods IK and IW), and about 15 ml in reduced baths of high alkalinity (method IN). Then a couple of grams of common salt is added and the flask is shaken to dissolve the salt, at least practically.

From the dyebath, 50 ml are withdrawn rapidly by means of a volumetric pipette and introduced into the volumetric flask,

putting the end of the pipette under the surface of the formaldehyde so that the dye liquor does not come into contact with the air. The flask is rapidly filled up to the mark with water and allowed to stand for a couple of minutes. The flask is shaken until the liquid is homogeneous, then it is filtered through a dry filter paper. 50 ml of the filtrate is titrated with N/10 iodine using a starch indicator. In the beginning, the iodine is consumed very quickly, toward the end point it is absorbed more slowly. The end of the reaction is indicated by a blue coloration persisting for 10 to 15 seconds.

1 ml iodine N/10 = 0.004353 g sodium hydrosulfite or

The iodine consumed / 0.004353 / 40 = no. of grams hydrosulfite in 1 liter.

REFERENCES

(1) Tatu, H, "L'analyse chimique dans l'industrie textile".

(2) Trotman, E R, "Textile Analysis", 1932 edition, page 114.

(3) Baselli, A, "Gli idrosolfiti—Edito a cura dell'Appula".

(4) "Vademecum analitico Montecatini", 1951 edition, page 361.

(5) AATCC, "Analytical Methods for a Textile Laboratory", 1949.

(6) *Tech Bull (Du Pont)*, No. 1, page 3 (1950).

(7) Airoldi, A, "Significato del simbolo rH e sua importanza nel campo tessile", *Fibre e Colori*, 1952, No. 6, p253; No. 7, p279.

(8) "L'applicazione dei coloranti di riduzione nella tintura in continuo—Il controllo dei potenziali Redox nel processo Marhen", *Tinctoria*, 1952, No. 7, p213; "The Marhen Process", *Am Dyestuff Reptr* 41, No. 10, p292 (1952).

(9) Treadwell, F P, "Trattato di Chimica analitica"—II edition, page 814 (Metodo di Franzen per il dosaggio dell'os-sigeno).

(10) Feibelmann, "Semplici apparecchi di controllo analitico per fabbrica", *Tinctoria*, 1952, No. 5, page 209.

(11) Robinet, M, "Précis de teinture des fibres textiles", page 411.

(12) Algerino, A, "Chemica analitica applicata all'industria tessile e tintoria"—Vol II.

(13) Pascal, P, "Traité de chimie minerale"—Vol VI, page 499.

APPARATUS FOR TREATMENT OF COTTON FABRICS ON A LABORATORY SCALE

WALTER T SCHREIBER and AUSTIN C F MASON

*Southern Regional Research Laboratory**
New Orleans, Louisiana

THE apparatus here described has been found useful in laboratory scale experiments in which cotton fabrics were chemically treated by exposure to reacting liquids. Its design is such that only a small volume of reagent is required to treat a fabric sample large enough for evaluation by certain physical tests. Conditions of temperature and time of exposure can be controlled and uniform exposure of all portions of the sample to the reagent can be accomplished.

As pictured in Figure 1, the apparatus was made up of a hollow glass cylinder (A), 70 mm by 410 mm, with one end sealed and the other end fitted with a 71 mm/60 mm ground glass section; a hollow glass cylinder (B), about the same height as (A), but slightly smaller in diameter; and a condenser (C), attached to a ground glass adapter.

In constructing (B), a glass cylinder having a pebbled surface was weighted with shot, then closed off and fitted with a lifting hook or handle, and with a set of three plates having nail-like prongs on which to anchor the fabric during treatment. The prongs are part of what was initially a ⅜-inch square of 1/16-inch stainless-steel plate. A 3/16-inch strip along each of two opposite ends of these plates had been bent in the same direction, so as to make a right angle with the main body of the plate. The bent portions were filed down so that only two sharply pointed spikes or nail-like projections remained. These plates were mounted on the glass cylinder (B) by use of small glass rods. One end of each of these rods was fused to the cylinder, while the other end, after passing through a hole in the center of the plate was flared, thus holding the plate in place with its nail-like projections extending outward from the cylinder. The plates, three in number, were arranged vertically in a straight line along the outside surface of the cylinder, as shown in Figure 1 (B-1).

An 8- x 10-inch fabric sample to be treated, designated as B-2 on figure, is wrapped around cylinder B and held in place on the cylinder by impaling lengthwise edges on the three sets of prongs. Cylinder B, was then placed inside cylinder A, the reacting liquid added, the condenser attached and the apparatus placed in an oil or water bath which was maintained at a desired temperature.

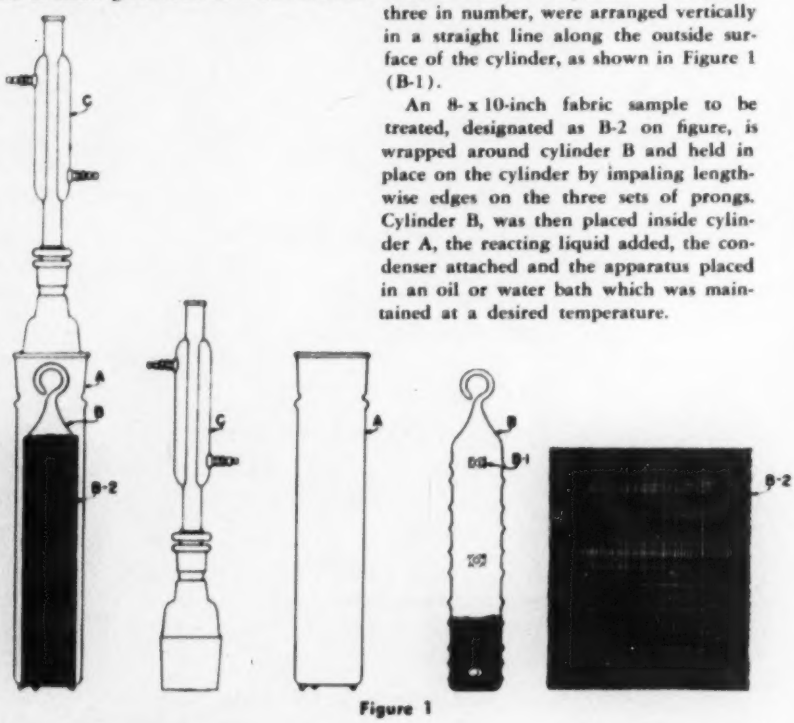


Figure 1

* One of the laboratories of the Southern Utilization Research Branch, Agricultural Research Service, U S Department of Agriculture.

Proceedings of the

American Association of Textile Chemists and Colorists

Copyright, 1955, American Association of Textile Chemists and Colorists

Editor of Proceedings: Carl Z Draves, 30 Lahey St, New Hyde Park, N Y

APRIL 25, 1955

National Officers of the Association

President ..... RAYMOND W JACOBY, Ciba Co, Inc, 627 Greenwich St, New York 14, N Y

Vice President (Central Atlantic Region) ..... GEORGE L BAXTER, Bradford Dyeing Association, 40 Worth St, New York 13, N Y

Vice President (Western Region) ..... JOSEPH H JONES, Phoenix Dye Works, 1963 Southport Ave, Chicago 14, Ill

Vice President (New England Region) ..... GEORGE O LINBERG, Synthron, Inc, Ashton, R I

Vice President (Southern Region) ..... WALTER M SCOTT, U S Dept of Agriculture, Washington 25, D C

Secretary ..... HAROLD C CHAPIN, Lowell Technological Institute, Lowell, Mass

Assistant Secretary ..... RICHARD R FREY, Lowell Technological Institute, Lowell, Mass

Treasurer ..... ALBERT E SAMPSON, National Aniline Division, Allied Chemical & Dye Corp, 150 Causeway St, Boston 14, Mass

Founder ..... LOUIS A OLNEY (Deceased)

Chairman of the Executive Committee on Research ..... LEONARD S LITTLE, 101 West 31st Street, Room 1500, New York 1, N Y

Director of Research ..... HAROLD W STIEGLER, Lowell Technological Institute, Lowell, Mass

Standing Committees of the Council

Technical Committee on Research ..... CHARLES W DORN, *Chairman*
Publicity ..... JAMES A DOYLE, *Chairman*
Conventions ..... GEORGE O LINBERG, *Chairman*
Appropriations ..... ALBERT E SAMPSON, *Chairman*
Constitution and Bylaws ..... HAROLD C CHAPIN, *Chairman*
Membership and Local Sections ..... GEORGE L BAXTER, *Chairman*
Corporate Membership ..... ALBERT E JOHNSON, *Chairman*
Publications ..... PERCIVAL THEEL, *Chairman*
Technical Program ..... ARTHUR W ETCHELLS, *Chairman*
Technical Supplies ..... HAROLD C CHAPIN, *Chairman*

Councilors

Representing Sections

NEW ENGLAND REGION

Northern New England: JOHN P PLOUBIDES, ROBERT D ROBINSON, ERNEST R KASWELL
Rhode Island: ERNEST J CHORNYEI, EDWARD H GAMBLE, THORWALD LARSON, EDWARD W LAWRENCE
Western New England: RUDOLPH C GEERING

CENTRAL ATLANTIC REGION

Hudson-Mohawk: ALBERT E HERRMANN, JR, IRWIN J SMITH
New York: ROBERT C ALLISON, MATTHEW J BABEY, WILLIAM F BROMMELSIEK, JOHN H HENNESSEY, PATRICK J KENNEDY, PAUL J LUCK, JAMES J MARSHALL
Niagara Frontier: J EDWARD LYNN
Philadelphia: CARLETON T ANDERSON, EDWARD C DIEHL, ARTHUR W ETCHELLS, HARRY L MORGAN, RICHARD A SHIMP, JACKSON A WOODRUFF

SOUTHERN REGION

Piedmont: HARLEY Y JENNINGS, M M McCANN, RAPHAEL E RUPP, HENRY A RUTHERFORD, R HOBART SOUTHER
South Central: JOSEPH D MOSHEIM
Southeastern: S JACK DAVIS, WILLIAM B GRIFFIN
Washington: LAWRENCE L HEFFNER

WESTERN REGION

Mid-West: ERIC W CAMP, SAMUEL KLEIN, L B MacFARLAND
Pacific Northwest: HUBERT A DESMARAIS
Pacific Southwest: SIDNEY SPRINGER

Past Presidents

ELVIN H KILLHEFFER, P J WOOD, WILLIAM H CADY, ALBAN EAVENSON, CARL Z DRAVES, THOMAS R SMITH, WILLIAM D APPEL, HENRY F HERRMANN, C NORRIS RABOLD, J ROBERT BONNAR

Local Section Officers

New England Region

NORTHERN NEW ENGLAND

Chairman ..... JOHN M GOULD, Barre Wool Combing Co, Ltd, South Barre, Mass
Secretary ..... AZEL W MACK, Dexter Chemical Corp, 581 Boylston St, Boston 16, Mass
Vice Chairman—EDWARD B BELL *Treasurer*—WILLIAM W PENNOCK

RHODE ISLAND

Chairman ..... ARTHUR F McLEAN, Glenlyon Print Works, Phillipsdale, R I
Secretary ..... CHARLES F STOKES, Carbic-Moss Corp, 87 Weybosset St, Providence, R I
Vice Chairman—REMUS F CAROSELLI *Treasurer*—J WILLIAM TIMPERLEY

WESTERN NEW ENGLAND

Chairman ..... SOCRATES V VANIOTIS, National Aniline Div, Allied Chemical & Dye Corp, 40 Rector St, New York, N Y
Secretary ..... NATHANIEL J GLADE, American Cyanamid Co, 1937 W Main St, Stamford, Conn
Vice Chairman—JOHN E HIRN, SR *Treasurer*—THOMAS J GILLICK, JR

Central Atlantic Region

HUDSON-MOHAWK

Chairman ..... HARVEY G GENDREAU, Sandoz Chemical Works, Inc, 24 Jermain St, Albany, N Y
Secretary ..... LEONARD S LANG, Cluett, Peabody & Co, Inc, 116th St and 6th Ave, North Troy, N Y
Vice Chairman—WILLIAM A NELSON *Treasurer*—JOHN W MERRILL

NEW YORK

Chairman ..... JOHN H HENNESSEY, Berkshire Color & Chemical Co, Delawanna, N J
Secretary ..... NORMAN A JOHNSON, American Dyestuff Reporter, 44 East 23rd St, New York 10, N Y
Vice Chairman—EDMUND A LEONARD *Treasurer*—JOHN A KOMNINOS

NIAGARA FRONTIER

Chairman ..... J G KERN, National Aniline Div, Allied Chemical & Dye Corp, Box 975, Buffalo 5, N Y
Secretary ..... M R HALLINAN, National Aniline Div, Allied Chemical & Dye Corp, Box 975, Buffalo 5, N Y
Vice Chairman—JOHN WALLACE *Treasurer*—A M VIDITZ-WARD

PHILADELPHIA

Chairman ..... FREDERICK V TRAUT, Globe Dye Works Co, Philadelphia 24, Pa
Secretary ..... THOMAS J SCANLON, T J Scanlon Co, P O Box 211, Springfield, Delaware Co, Pa
Vice Chairman—THOMAS H HART *Treasurer*—PERCIVAL THEEL

Southern Region

PIEDMONT

Chairman ..... HERMAN J JORDAN, JR, Piedmont Processing Co, Belmont, N C
Secretary ..... WARREN E RIXON, Carbide & Carbon Chemicals Co, 112 S Tryon St, Charlotte, N C
Vice Chairman—CLARENCE HOOPER *Treasurer*—CLEMENT O STEVENSON

SOUTH CENTRAL

Chairman ..... JOE T BOHANNON, JR, American Aniline Products, Inc, 4001 Rossville Blvd, Chattanooga 7, Tenn
Secretary ..... J C WHITT, Standard-Coosa-Thatcher Co, Chattanooga, Tenn
Vice Chairman—WILLIAM F LUTHER *Treasurer*—ROBERT D BLUM, JR

SOUTHEASTERN

Chairman ..... T HOWARD McCAMY, Pepperell Mfg Co, Lindale, Ga
Secretary ..... JOHN C COOK, W R C Smith Publishing Co, 806 Peachtree St, NE, Atlanta, Ga
Vice Chairman—JAMES W SWINEY *Treasurer*—ROBERT B HALLOWELL

WASHINGTON

Chairman ..... GEORGE S BUCK, JR, National Cotton Council of America, 1832 M St, NW, Washington 6, D C
Secretary ..... NELSON F GETCHELL, National Cotton Council of America, 1832 M St, NW, Washington 6, D C
Vice Chairman—GEORGE P FULTON *Treasurer*—LOUIS R MIZELL

Western Region

MID-WEST

Chairman ..... ARTHUR I HULTBERG, Bear Brand Hosiery Co, Kankakee, Ill
Secretary ..... HARRY W ERICSON, American Aniline Products, Inc, 820 S Clinton St, Chicago 7, Ill
Vice Chairman—SAMUEL M LITTLEJOHN *Treasurer*—JACK G KELLEY

PACIFIC NORTHWEST

Chairman ..... ROBERT E NEWMAN, Jantzen Knitting Mills, Portland, Ore
Secretary ..... THEODORE M MARSHALL, Nyanza Color & Chemical Co, Inc, 115 SW Fourth Ave, Portland 4, Ore
Vice Chairman—ALEX H McKENZIE, JR *Treasurer*—JOHN L AYRES

PACIFIC SOUTHWEST

Chairman ..... JOHN SMITH, Dyemasters, Inc, 363 East Beach St, Inglewood, Calif
Secretary ..... CLARICE H LINDSEY, Univ of Calif, Dept of Home Economics, Los Angeles 24, Calif
Vice-Chairman ..... ROBERT A FLIEGEL *Treasurer* ..... ANGUS H ROBERTS

Student Chapters

BRADFORD DURFEE TECHNICAL INSTITUTE, CLEMSON COLLEGE, FAIRLEIGH DICKINSON COLLEGE, GEORGIA INSTITUTE OF TECHNOLOGY, LOWELL TECHNOLOGICAL INSTITUTE, NEW BEDFORD INSTITUTE OF TEXTILES AND TECHNOLOGY, NORTH CAROLINA STATE COLLEGE, PHILADELPHIA TEXTILE INSTITUTE, RHODE ISLAND SCHOOL OF DESIGN, UTICA TECHNICAL INSTITUTE

AATCC Newsgram

April 25, 1955

CORPORATE MEMBERSHIP DRIVE

A 50 percent increase in dues income for the Research Fund is the goal for the coming year of a corporate membership drive announced earlier this month by Association officials at a press meeting in New York.

Additional support from some 200 business firms will be sought for this dues revenue increase, which is needed to raise AATCC's research budget to $75,000 a year. Present corporate membership is 280 firms.

Dr H W Stiegler, AATCC director of research, said that the new funds will meet only the immediate need for the expansion and improvement of the Association's research facilities, although the campaign will be continuous in order for it to acquire the type of industry support needed to put the research program on the soundest footing.

A E Johnson, national corporate membership committee chairman, reported that more than 200 persons in AATCC are cooperating in the campaign and that early indications of interest in this project offer high hopes for its success.

For the benefit of press reprepresentatives, Dr Stiegler demonstrated the AATCC-developed Accelerotor, which, he pointed out, is capable of evaluating textiles in a few minutes for wear service, launderability, etc. This and other quick-test procedures developed by AATCC are becoming more and more essential for continuous quality checks in textile production. Dr Stiegler emphasized the increasing need for test methods, particularly with reference to end-use performance evaluation of textiles—a need which has been increased in proportion to the greater emphasis being put upon performance testing and quality control.

Other Association officials present at the meeting were Raymond W Jacoby, president, Leonard S Little, chairman of the Executive Committee on Research, and Charles W Dorn, chairman of the Technical Committee on Research.

1956 CONVENTION

The National Convention Committee has approved the recommendations of a special committee which was assigned to study the situation arising from the fact that the 1956 Annual Convention will be part of the Perkin Centennial.

The Host Region for the '56 Convention will be the Central Atlantic Region, excepting the Philadelphia Section, which is host to this year's convention. Therefore, the host sections for 1956 will include New York, Hudson-Mohawk and Niagara Frontier.

A definition of surplus and distribution of same, as mentioned in the Bylaws, was agreed upon.

Chairmen of the subcommittees of the Perkin Centennial will be responsible for the activities in their field in connection with the AATCC Convention. No separate chairmen will be appointed for the AATCC Convention, as this would lead to duplication and confusion.

PERKIN CENTENNIAL

Stationery for the Perkin Centennial has been submitted for approval by Robert J Hamilton, chairman of the Printing Committee. Listed on the left side are the names of all participating societies, while on the right side, near the top, there will be separate imprints of committees and respective chairmen.

The stationery will be a mauve shade, which was determined from the spectrophotometric curves for Perkin's original mauve. The printing will be in a magenta shade.

Ansco Brunier, Jr, chairman of the Publicity Committee for the Centennial, reports that the Textile Color Card Association of the United States is going to feature Perkin's mauve for 1956. TCCA has been invited to sponsor as a topic at the Centennial "Color Harmony from Fashion to Industry".

EDWIN P JOHNSTONE

The death of Edwin P Johnstone, technical manager of the AATCC Research Laboratories, leaves a void in the Association's research structure which will be hard to fill. Mr Johnstone, a key figure in the Lowell operation, died on April 9th at the age of 49.

AATCC CALENDAR

(A general calendar of events may be found on page 312)

COUNCIL
Apr 29 (Hotel Dennis, Atlantic City, N J); June 17; Wednesday evening, Sept. 21 (Chalfonte-Haddon Hall, Atlantic City, N J); Nov 18; Jan 20, 1956; Apr 20, 1956; June 15, 1956.

NATIONAL CONVENTIONS
Sept 22-24, 1955 (Chalfonte-Haddon Hall, Atlantic City, N J); 1956 (Waldorf-Astoria, New York); 1957 (Boston); 1958 (Chicago); 1959 (Washington, DC—tentative).

HUDSON-MOHAWK SECTION
May 20 (Ladies Night); June 24 (Annual Outing).

MID-WEST SECTION
June 11 (Annual Outing—Lake Lawn Lodge, Delavan, Wis).

NIAGARA FRONTIER SECTION
June 24 (Outing).

NEW YORK SECTION
May 20 (Kohler's Swiss Chalet, Rochelle Park, N J); June 17 (Outing—North Jersey Country Club, Wayne, N J).

NORTHERN NEW ENGLAND SECTION
June 10 (Annual Outing); Oct 14; Dec 9.

PACIFIC SOUTHWEST SECTION
Apr 29, June 3, Oct 7, Feb 6 (Gourmet Restaurant, Beverly Hills, Calif); Dec 2.

PHILADELPHIA SECTION
May 20 (Outing——Manufacturer's Golf & Country Club, Oreland, Pa); Oct 21 (Penn-Sherwood Hotel); Dec 2, Jan 13 (Kugler's Restaurant).

PIEDMONT SECTION
Apr 30 (Robert E Lee Hotel, Winston-Salem, N C); June 10-11 (Mayview Manor, Blowing Rock, N C); Oct 29 (Hotel Wm R Barringer, Charlotte, N C).

RHODE ISLAND SECTION
May 13 (Ladies' Night, Sheraton Biltmore Hotel, Providence); June 10 (Annual Outing, Pawtucket Country Club, Pawtucket, R I); Oct 13, Dec 1 (Johnson's Hummocks, Providence)

SOUTH CENTRAL SECTION
May 14 (Hotel Patten, Chattanooga, Tenn); July 29-30 (Lookout Mtn Hotel, Chattanooga, Tenn — pending); Dec 10 (Hotel Patten, Chattanooga, Tenn).

SOUTHEASTERN SECTION
June 3-4 (Annual Outing, Radium Springs, Ga); Sept 10 (Ralston Hotel, Columbus, Ga); Dec 3 (Atlanta Biltmore, Atlanta, Ga).

WASHINGTON SECTION
May 20.

WESTERN NEW ENGLAND SECTION
May 13 (Ladies Night); June 17 (Annual Outing); Sept 16 (Rapp's); Nov 4 (Hartford, Conn); Dec 16 (Rapp's).

Buttons bearing the insignia of the AATCC are available from the Secretary at a new price of $2.25. Pins, with safety clasp, are also available at $2.50 each. Write directly to H C Chapin, AATCC Secretary, Post Office Box 28, Lowell, Mass.

EDWIN P JOHNSTONE

Technical Manager, AATCC Research Labs

EDWIN P JOHNSTONE, technical manager of AATCC's Research Laboratories at Lowell, Mass, died April 9th at St John's Hospital. He was 49.

Mr Johnstone was born February 12, 1906 in New Haven, Conn where he lived for the greater part of his early life. A member of the class of 1929 of the Lowell Technological Institute, he began his textile career at the Rockland County Print Works in Haverstraw, N Y. From the Rockland Print Works Mr Johnstone moved on to the Farr Alpaca Co, Holyoke, Mass, where he was chief chemist for 8 years. He was associated with American Cyanamid Co, United Merchants Laboratories and L Sonneborn & Sons before coming to AATCC in Lowell in 1945. It was while he was at the Stamford Research Laboratories of American Cyanamid that he, in collaboration with a fellow researcher, was able to perfect a shrinkage control process for woolens. These efforts were culminated in the issuance of the Lanaset patents in the names of both workers.

Mr Johnstone's early work with the Association concerned itself with a Chemical Warfare Project, studying methods for treating textiles which would afford protection against poisonous gases. In addition to his supervisory duties during the past few years, Mr Johnstone has done much to advance AATCC's flammability program and has contributed worthwhile studies on dimensional stability and drycleaning test methods.

Mr Johnstone was a member of the Northern New England Section, AATCC, and Omicron Pi Fraternity.

He is survived by his wife, Lucy, and three sons: Edward D, with the U S Navy in Washington; Phillip E, with the U S Air Force at Roswell, N M, and Robert T, of Chelmsford, Mass.

ACTIVITIES OF THE LOCAL SECTIONS

FAIRLEIGH DICKINSON COLLEGE STUDENT CHAPTER——A Textile Career Conference and Printed Fabrics Exhibit, under the auspices of Fairleigh Dickinson College and the AATCC Student Chapter at the College attracted a large turnout on March 10th. The morning session was designed for high school students, while the evening session was held for day and evening students and the public. The program, which featured prominent speakers and demonstrations, was held in the Hesslein Building at the Rutherford, N J, campus.

* * * * * *

PHILADELPHIA——The Philadelphia Section will hold its annual outing this year at the Manufacturer's Golf and Country Club, Oreland, Pa, on Friday, May 20th.

Fred V Traut, chairman of the Section, has appointed Ernst Empting of General Dyestuff Co to act as general chairman of the Outing Committee. Mr Empting has stated that, in addition to the usual events, such as golf, cards, darts and quoits, there will be additional special activities. The day will be climaxed by a roast beef or rockfish dinner, followed by an evening of entertainment. Many prizes will be distributed throughout the day to members and guests.

Reservations may be placed with Edward G Haack, General Dyestuff Company, 123 South Second Street, Philadelphia 6, Pa.

* * * * * *

RHODE ISLAND——The March 31st meeting of the Rhode Island Section was held at the quarters of the Providence Engineering Society, Providence, R I. Approximately 175 members and guests attended the meeting and 70 members and guests enjoyed a pre-meeting social and dinner at the Crown Hotel.

Dr George W Parks, head of the Department of Chemistry at the University of Rhode Island, spoke on the latest developments in the work of the U S Quartermaster on textiles. In addition, Dr C J Weidmann, technical director, Ciba Co, Inc, did the commentary in conjunction with the showing of a colored film on the "Cibalans".

1955 Convention Papers

THE Technical Program Committee has announced its desire to receive applications for the presentation of papers at the AATCC Convention in Atlantic City during September 1955.

The papers should be within the scope of the AATCC interests as defined in the Constitution. (See 1954 Technical Manual and Year Book of AATCC, page 24).

Papers are especially welcome in the field of dyeing and finishing of fibers, yarns or fabrics, either from a practical or a theoretical viewpoint.

The Committee would also like to have several papers covering some aspect of laundering or drycleaning.

Papers on printing are always popular with the members, and anyone having a new approach will find his paper well received.

Papers on bleaching or other chemical treatments applied to textiles are also sought by the Committee.

New developments in dyes, chemicals, or mechanical equipment could be a very interesting subject for a paper.

An early reply by those wishing to present papers is requested by the Technical Program Committee as it expects to have the entire program completed by the first of June.

Please address replies together with a brief description of the subject of the paper to:

A W Etchells,
The Hellwig Dyeing Corporation,
Comly St & Delaware Ave,
Philadelphia 24, Pa.

THE TECHNICAL PROGRAM COMMITTEE
M H Klein
P Theel
G Turnbull, Jr
G Wunsch
A W Etchells, *Chairman*

MEMBERSHIP APPLICATIONS

April 7, 1955

SENIOR

Alex Alexander — Supt of dyeing & finishing, Collins & Aikman of Canada, Ltd, Farnham, Que, Canada. Sponsors: R W Redston, F J Knight.

Frederick W Arbusto — Exec asst to vice pres, boss finisher, Robertson Bleachery & Dye Wks, Inc, New Milford, Conn. (WNE). Sponsors: L S Little, A E Johnson.

Alexander A Bevino — Dyer, Bay State Dyeing & Finishing Co, Bondsville, Mass. (WNE). Sponsors: H P Baumann, P J LaMonica.

Gordon Boyko — Asst to quality control mgr, Pacific Mills, New York, N Y. (NY). Sponsors: J F Corbett, C H Huggins Jr.

Lawrence F Faragalli — Pres, Paterson Skein Dyeing & Fin Inc, Paterson, N J. (NY). Sponsors: A R Buglione, T H Hart.

Rodney H Harm — Asst to plant mgr, Dublin Finishing Plant (Burlington Industries), Dublin, Va. (PIED). Sponsors: D Moss, L W Cleveland.

Frank Hauser — Dyer, Trudeau's Cleaners & Dyers, Edmonton, Alberta, Canada. Sponsors: P W Benn, F Schaeppi.

James Leigh — Supt, greige processing, Waldrich Co, Delawanna, N J. (NY). Sponsors: M Blitz, J H Hennessey.

Julian F Mangum — Dyer, Burlington Mills Corp, Wake Forest, N C. (PIED). Sponsors: P R VanKerckhove, E W Teague.

Harold Naidus — Chemist, dir, dev & sales, Polyvinyl Chem Div, Stahl Finish Co, Peabody, Mass. (NNE). Sponsors: W J Murray, L Shapiro.

Frank A Pistone — Dyer, Atlantic Dyeing Corp, Glendale, N Y. (NY). Sponsors: J H Pistone, P W Pursell.

Charles N Robertson — Exec vice pres, Robertson Bleachery & Dye Wks, New Milford, Conn. (WNE). Sponsors: L S Little, A E Johnson.

Theodore A Sheets — Owner, Swiss Dyers, Springfield, O. (MW). Sponsors: A A Coleman, A T Brainerd.

Lester N Stanley — Group leader, Gen Aniline Works, Rensselaer, N Y. (HM) Sponsors: S M Roberts, J C Moessinger.

George M Swartzwelder — Asst to plant prod mgr, Althouse Chem Co, Reading, Pa. (PHIL). Sponsors: L Procter, R S Withers.

Victor J Vincent, Jr—Colorist, E I du Pont de Nemours & Co, Inc, Atlanta, Ga. (SE). Sponsors: L A Burroughs, W F Crayton.

ASSOCIATE

John B Weiser — Dyer, Angro Fabrics Co, Inc, Webster, Mass. (RI).

CORPORATE

Progressive Color & Chem Co.

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

William E Aldrich, A Wolf Grunberg

Rhode Island Section——

PROGRESS OF SILICONES IN THE TEXTILE INDUSTRY*

F L DENNETT

Dow Corning Corporation
Midland, Mich

In the relatively short period of five years, the use of silicones as textile finishes has grown from a small beginning on two or three fibers to substantial proportions on all fibers. This has been due in large measure to the development of stable emulsions that are readily diluted and applied to all fibers.

Special mention has been made of a new upholstery finish as well as a finish especially designed to impart water repellency and spot resistance to wool.

A brief summary of laboratory work and mill trials shows that the application of still another silicone emulsion formulation will effectively reduce the felting shrinkage of wool.

INTRODUCTION

ON October 28, 1949 I had the pleasure of talking to your group about the uses of silicones. I described water repellents, antifoaming agents, heat-stable greases and insulation for electric motors exposed to overloads, high surrounding temperatures, excessive moisture, or corrosive atmospheres.

Since that time, men in the textile industry have made great progress in the use of these unique materials. And all of a sudden everybody seems to be talking about silicones. I would like to have you consider with me the reasons for this interest, and then I will discuss their importance to you, specifically, as textile-finishing materials.

First, we will consider the progress made in the field of silicone finishes. Dow Corning introduced the first silicone finishes in the form of Decetex 104 to impart water repellency to nylon and acetate fabrics and resistance to water-borne spots. We supplied this silicone product as a solution, which had to be emulsified at the finishing plant just prior to use. At best this was an exacting task, resulting in an emulsion of only moderate stability. Besides, it required close control in application and a temperature of 300°F to complete the cure.

Today you can buy stable ready-to-use emulsions, which are produced by several suppliers. These offer ease of application and good bath stability under almost any condition. They are applicable to all of the common fibers and fiber blends including wool, viscose, and cotton as well as the synthetics, such as Orlon, Dacron, nylon, and Acrilan. Application is even possible to such fibers as Dynel, silk, Bemberg rayon, and Vicara.

In addition to excellent water repellency and spot resistance, which are durable to repeated dry cleanings or launderings, a wide variety of other properties have been noted for these silicone finishes. These other factors are now making a strong bid to overshadow the original function of these finishes as water repellents. For example, you can change a harsh fabric to one that possesses durable softness, or you can give a soft fabric the fullness and dry, firm hand of a worsted. You can make a wool fabric, which is naturally resistant to soiling, even more spot-resistant. You can improve its resistance to wrinkling in a number of instances. You can make cotton velveteen really feel like velvet. And now there is good evidence that you can make wool more resistant to felting while letting it retain the advantages of spot resistance and its natural desirable hand.

How have all these things been accomplished *First*, because we have enjoyed the helpful co-operation of people in many fine textile organizations, including mills, finishers, and garment makers. *Second*, through the development of excellent formulations by many of our textile specialty manufacturers. *Third*, by our own continued research and development efforts at Dow Corning and by our ability to produce adequate amounts of the desired silicone products for use by formulators and mills.

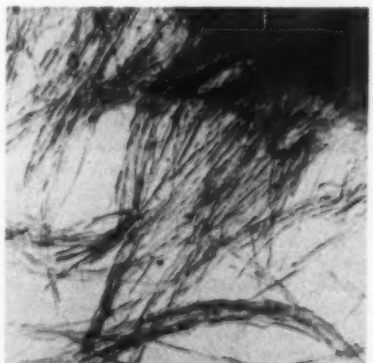


Figure 1

GENERAL SILICONE FINISHES

Silicones are unique in that an application of one to two percent owf (on weight of fabric) is usually sufficient to produce the desired results. This is evidenced by the fact that a silicone-treated fiber appears to have a continuous coating around it which protects the fiber but does not interfere with the porosity of the fabric. This can be seen in Figure 1, which shows the rod-like silicone-polymer shape that remains after dissolving the acetate from a treated acetate fabric with acetone. Although this has not been proven for other fibers, we expect the results to be somewhat the same in all cases.

A silicone polymer is resistant to standard dry-cleaning solvents even though soaps are present. Water and mild soaps also show little effect.

SIMPLICITY OF APPLICATION—— The application of the newer, ready-prepared silicone emulsions to fabrics has been simplified to a point where very little control is needed. A clean fabric, free of wetting agents, sizing, excess dye and dyeing assistants, plus adequate facilities for curing the finish at temperatures above 250°F are all that is required. Any conventional method of applying the emulsions is satisfactory, as long as an accurate wet-pickup value for the fabric and equipment being used is known.

The emulsion is diluted with cold water. The catalyst, which is usually a water-soluble or emulsified zinc or tin salt, is then added according to the directions of the supplier. The dilution is

* Presented at Johnson's Commodore Room in Providence, R I, on Thursday evening, Oct 14, 1954.

arranged so that a pickup of 0.5 to 2.0% solids is obtained. The silicone deposited on the fabric is adjusted depending on the results desired and the type of fabric being treated. In most cases a silicone content of 1.25-1.5% is adequate for maximum water repellency, excellent durability to dry cleaning and laundering as well as development of all the other desirable properties of a silicone-finished fabric. In general, urea-formaldehyde and melamine-formaldehyde resins can be added to the silicone emulsion for simultaneous applications over and above those available with the silicone finishes alone.

SYLMER FINISH———Considerable publicity has recently been given to a silicone treatment designated as "Sylmer". It is designed as a treatment for both furniture and automotive upholstery, particularly those fabrics prepared from synthetic yarns or blends of these yarns with cotton. This finish is of great importance to the consumer since its exceptional water repellency makes it so impervious to waterborne stains that the fabric stays new looking longer. Oil and oil-borne stains, although not repelled by a Sylmer finish, are much easier to remove since the protective envelope of silicone surrounding each yarn keeps the soil from penetrating the fibers. Such soils can be easily removed by sponging with a cloth dampened with a solvent cleaner.

One important fact has been noted for the Sylmer finish which is a direct result of the method of formulation. Oily spots can be removed by spotting techniques without the hazard of forming a solvent ring. This ring caused by spotting is a common but not clearly understood phenomenon. It appears that the particles of soil and some oils and dyes are merely moved by the cleaning solvent and concentrate in the outer portion of surface wetted by the solvent. This produces a definite ring when the solvent has evaporated. This feature is clearly illustrated in Figure 2 showing treated and untreated fabrics from which lipstick has been removed.

Like the other silicone finishes, Sylmer is simply applied to the fabric from a prepared emulsion, dried, and cured at temperatures above 250°F. Fade-Ometer and outdoor-exposure tests have shown that this finish does not harm the light fastness, and in most cases slightly improves this property in upholstery fabrics.

NEW SILICONE WOOL FINISH——One of the newer silicone finishes has been designed especially for wool. Until recently very little work had been done on wool because of the fact that curing temperatures of 300°F and above were much too high for wool fibers. Many of the wool colors were also very sensitive to such high temperatures. With the advent of a better catalyst, a finish that cures at 250°F has been especially designed for wool. For example, a 14-oz suiting fabric can be cured in 7-10 minutes at 250°F.

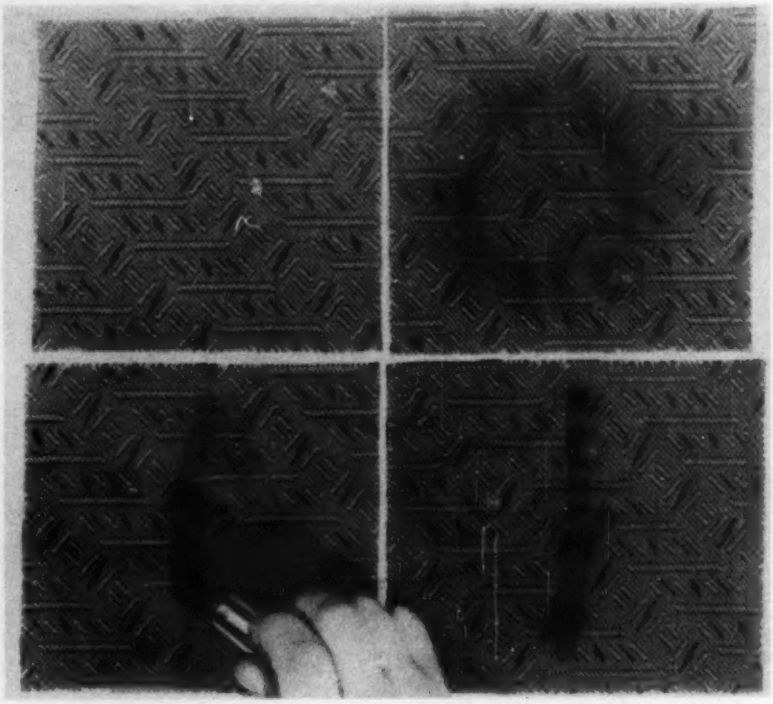


Figure 2

This finish, identified as Dow Corning 105 Emulsion, produces a full round hand and on some fabrics gives the desirable impression of increased thickness and fullness. Initial spray ratings of 100 are easily obtained even on fabrics having considerable nap. The finish has the resistance to dry-cleaning solvents usually associated with silicones. In addition to water repellency, grease resistance has been incorporated in this finish. Although the finish cannot be termed grease repellent, it does permit easy removal of grease spots and oily soils with spotting fluids without the necessity of complete dry cleaning.

The application of Dow Corning 105 is very similar to that recommended for other silicone finishes designed for synthetics and blends. Supplied as a 40%-solids emulsion, Dow Corning 105 is mixed with a prepared catalyst emulsion and then is diluted to give a 1.5-2.1% silicone-solids pickup. A typical pad bath for treating a 100% wool suiting is as follows:

20 lb Dow Corning 105 Emulsion
4 lb Dow Corning Catalyst XEY-21 Emulsion
47 gal water.

ABRASION TESTS OF FINISHED WOOL———Tensile-strength and abrasion tests are of prime interest on treated fabric. Limited work has shown encouraging results, and this testing program is being carried on until a wide variety of constructions containing several grades of wool have been thoroughly investigated so that performance can be accurately predicted. Table I lists some typical flex-abrasion-resistance results on treated and untreated wools. Tensile-strength data obtained to date show no significant improvement in the treated fabric, but it is most important that the original values are maintained in almost every case.

By virtue of the water repellency imparted to the fiber, there is a definite improvement in the ability of the fabric to maintain a crease or press under humid or wet conditions. This is dramatically shown when a pair of trousers with one treated and one untreated leg are worn in the rain (see Figure 3).

TABLE I
EFFECT OF DOW CORNING 105 EMULSION ON ABRASION RESISTANCE OF WOOL FABRICS

Average CSI Stoll Flex-Abrasion Values

Type of Fabric	*Untreated*	*Treated*
Gabardine	1396	2674
Flannel	640	862
Covert	1493	1856
Uniform fabric	3304	3741

Figure 3

ORGANOSILICON POLYMERS FOR PREVENTION OF WOOL FELTING AND SHRINKAGE

VAPOR APPLICATION——The application of organosilicon polymers to wool to produce resistance to felting shrinkage has been reported by Neish and Speakman *(1)* and Alexander, Carter and Earland *(2)*. Both of these references applied chlorosilanes either from solution or vapor phase, which were hydrolyzed by moisture present in the wool to produce polymers that imparted nonfelting characteristics to the wool. The application of chlorosilanes to a fabric presents problems, however, since they are corrosive, inflammable, and difficult to handle.

EMULSION APPLICATION——During the past two years an intensive effort has been made to prepare a silicone emulsion that could be easily handled and that would effectively reduce felting shrinkage. Considerable progress can be reported at this time. Laboratory results show that Dow Corning 112 emulsion, applied to woolen blanket-type fabrics as well as to other constructions, will effectively reduce felting shrinkage with repeated launderings. Results from mill trials confirm these findings, although as yet maximum results have not been attained.

Dow Corning 112 emulsion contains 40% silicone solids. It is especially formulated to reduce felting, although it produces the properties of desirable hand, durable water repellency and spot resistance that are associated with the other silicone finishes. Applied with a catalyst so that 3-5% silicone solids are deposited on the fiber, it is then dried and cured at 250°F. The curing time varies with the weight and construction of the fabric although it is usually 8-15 minutes. Table II shows typical data obtained on a variety of fabrics.

TABLE II
FELTING RESISTANCE OF WOOLEN FABRICS TREATED WITH DOW CORNING 112

		Relaxation Shrinkage %	Total Shrinkage %		Actual Total Felting
			1st Wash	10th Wash	
Treated blanket	warp	3.4	5.0	5.4	2.0
	fill	0.6	0.0	0.4	0.4
Untreated blanket	warp	4.2	18.8	18.7	14.5
	fill	1.3	14.2	14.0	12.7
Treated suiting	warp	2.9	3.4	6.2	3.3
	fill	2.0	1.7	4.5	2.5
Untreated suiting	warp	3.8	9.6	25.1	21.3
	fill	3.4	5.5	18.9	15.5

Relaxation shrinkage was determined by soaking the samples for 4 hours in water at room temperature. Each laundering consisted of 15 minutes in a reversing wash-wheel at 140°F with sufficient neutral soap to produce suds. Two 7½-minute rinses in the reversing wash-wheel were used, the first at 120°F and the second at room temperature. Test samples were extracted and tumble dried between each washing cycle.

WOOL BLENDS——Work with wool blends has shown similarly satisfactory results if the wool content is above 50%. With percentages lower than this, very little stabilization results. Strength tests indicate that there is little if any loss in tensile strength with the treatment. In general, abrasion results closely parallel those reported for Dow Corning 105.

CONSIDERATION OF SILICONE FINISH ON WOOL——The mechanism whereby this silicone formulation reduces the tendency of wool to felt has not been fully investigated. It is believed that it is dependent on the particular orientation of the silicone on the fiber as well as on a masking effect on the scaly structure of the fiber. The degree of antifelting obtained appears to be dependent upon the amount of silicone deposited, with maximum results obtained at a 5% level.

The treatment of wool with silicone emulsions to obtain resistance to felting offers several interesting points, which are listed below:

(a) Simple application consisting of padding, drying and curing at 250°F.

(b) The time consumed is only that actually required to process fabric. No afterwashing of the treated fabric is necessary.

(c) The hand of the fabric is round and full.

(d) The tensile strength appears to be maintained with improvement noted in flex abrasion.

(e) The weight of the fabric is increased as much as 3-4%; this can mean a reduction in the quantity of wool required in some cases.

(f) Treatment is applied to fabric just prior to final finishing.

(g) Napping, shearing and decatizing can be carried out on treated fabric.

FUTURE WORK ON METHOD——Factors still to be worked out in mill operation are a determination of most efficient quantity of silicone to be applied, proper curing techniques, and proper handling to give minimum relaxation. Laboratory work is still being carried on to produce better catalysts, to obtain additional performance data and to determine the effects of construction and wool grades on the results produced. With a stable emulsion system available for investigation, the above factors should be determined shortly, so that a more complete story on this interesting development may be released in the near future.

REFERENCES

(1) Neish, W J P, and Speakman, J B, *Nature* 156, 176 (1945).

(2) Alexander, P, Carter, D, and Earland, C, *J Soc Dyers Colourists*, pp107-11, March, 1949.

—♦ ♦—

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

55-8

Education: M S, textile technology; B S, engineering; Associate of Textile Institute.

Experience: Director of research, quality control and waste control; large N E mill, six years.

Age 29; married; veteran; references; author of various papers; officer in technical societies; administrative position preferred.

4-11, 4-25

55-9

Education: College degree in textile chemistry & dyeing.

Experience: Chemist, director of dyeing & finishing; manager, cotton & synthetics.

Age 49; married; references; position as technical director, manager or sales technician desired; northeastern United States preferred.

4-11, 4-25

Atlanta Convention
Dyeing of Textiles——

A STUDY OF CARRIERS IN DYEING DACRON† POLYESTER FIBER*

C L ZIMMERMAN, J M MECCO and A J CARLINO

Research Division, American Cyanamid Company
Bound Brook, N J

A study has been made of various types of carriers and their effectiveness in promoting the dyeing of Dacron polyester fiber. The rate and the extent of exhaustion of several disperse (acetate-type) dyes in the presence of the various emulsified carriers are shown. The relative diffusion rates of these dyes are also depicted, and the importance of diffusion rate is discussed. The best carriers found in this study from the viewpoint of both cost and efficiency were methyl benzoate and methyl salicylate, which increase the rate of diffusion of disperse dyes in Dacron to such a degree that this fiber can now be dyed below the boil on any type of equipment.

INTRODUCTION

THE introduction of new fibers and the rapid expansion of the synthetic-fiber industry has made the dyer's job increasingly difficult. The use of these new fibers has resulted in fabrics with remarkable qualities; however, the dyeing of these fabrics has offered a challenge to both dyers and dyestuff manufacturers. In order to solve these problems new methods of application and new dyes had to be developed in many cases.

One reason for these dyeing difficulties is that most of the dyes and dyeing processes presently being used in the textile industry were developed for hydrophilic fibers, whereas almost all of the new synthetic fibers are hydrophobic. For this reason it is not surprising that disperse (acetate) dyes, which were developed for hydrophobic cellulose acetate, have affinity for all of these new synthetic fibers.

The polyester fibers, such as Dacron or Terylene, in addition to being hydrophobic, belong to the same general class of chemical compounds as cellulose acetate, all being esters. The polyester fibers have an affinity for disperse (acetate) dyes, but they are much more resistant to dyeing than cellulose acetate. Almost no acetate dye is sorbed by polyester fibers during a normal dyeing period when applied by normal acetate dyeing procedures at temperatures below the boil. At 212°F a few acetate dyes show fair exhaustion, but most of them show extremely poor penetration. Experiments were carried out by Waters *(8)* to find if the poor affinity of Terylene for acetate dyes was due to the inability of Terylene to absorb sufficient dye or whether it was due to the difficulty of the dye in entering and diffusing into the fiber. His results showed that the capacity of Terylene to sorb dye is almost as great as that of cellulose acetate. It is actually more dyeable than nylon. However, Waters found that at 185°F (85°C) these dyes diffuse 500 times faster into cellulose acetate and 700 times faster into nylon than into the polyester fiber Terylene. This observation suggests that the development of improved dyeing methods for polyester fibers should be directed toward ways of increasing the rate of diffusion of dyes into the fiber. Current methods used for dyeing Dacron polyester fiber employ one of two methods which have been found to increase the rate of diffusion of dyes into the fiber: 1) dyeing under pressure at elevated temperatures (above 212°F) without a carrier and 2) dyeing with a carrier at or near the boil. A carrier has been defined as a chemical assistant of limited water solubility which promotes penetration and sorption of dye *(6)*.

Dyeing at temperatures above the boil without carriers has many advantages. The expense of carriers and the necessity for their removal at the end of the dyeing is avoided. With some carriers there are also problems of toxicity, stream pollution, unpleasant odor and reduced fastness properties of the dyeings.

In spite of the above disadvantages, carrier dyeing is generally preferred for production dyeing *(1)*. The advantages of carriers in aqueous dyeing are increased exhaustion and penetration, improvement in leveling and, in many cases, improved fastness. High-temperature dyeing requires the installation of expensive pressure equipment, much of which is still in the development stage. By using carriers, Dacron can be dyed in conventional equipment.

EXPERIMENTAL

During an investigation in our laboratory of new ways to dye Dacron, it was found that certain emulsified aromatic esters are extremely powerful carriers for applying disperse dyes.[1] The initial results were extremely promising and led to an extensive study, some of which is described in this paper. For example, an oil-in-water emulsion of methyl salicylate prepared with dioctyl sodium sulfosuccinate as the emulsifying agent was very effective in applying Calcosyn Brilliant Scarlet BN to Dacron. By use of a concentration of only 8 g/l, a deep scarlet dyeing was obtained, which was completely uniform and commercially acceptable, as shown in Fig 1. In some of the preliminary work Dacron fabric was also dyed with several other acetate colors in the presence of methyl benzoate, methyl salicylate and isopropyl benzoate emulsified in a similar manner. In every case the dyeings were full-strength and completely uniform.

For comparison, dyeings were made using the same esters without emulsification. In all cases the dyeings were spotty and very uneven. This confirmed work recently reported in which the methyl esters of benzoic, anthranilic, m-toluic and salicylic acids were found to give spotty, unlevel dyeings whether used as is or as dispersions *(2)*.

The tendency for unemulsified ester to give unlevel dyeings was further illustrated by dyeings made on a reel-type machine. Experiments were carried out in which Dacron fabric was dyed on a small reel so that the fabric had to rise

† Du Pont trade-mark for its polyester fiber.
* Presented by C L Zimmerman before the Symposium on Dyeing of Textiles held at the Atlanta Biltmore Hotel in Atlanta, Ga, on Sept 16, 1954, with Kenneth S Campbell presiding.

[1] Patent applied for.

Figure 1

Dacron fabric dyed with 2% Calcosyn Brilliant Scarlet BN in the presence of 8 g/l emulsified methyl salicylate

out of the dyebath at regular intervals as it does in a dye beck. It was observed that the ester, being insoluble in water, formed a separate layer, part of which, despite its greater density, tended to float on top of the dyebath. When the Dacron fabric passed through this layer, the carrier was picked up unevenly, and an uneven dyeing resulted. For example, a piece of Dacron fabric dyed in a small laboratory reel machine with 2% Calcosyn Brilliant Scarlet BN (Pr 244) and 8 g/l of methyl salicylate gave a very spotty, uneven dyeing, as shown in Fig 2.

COMPARISON OF EMULSIFIERS ——A large number of emulsions of methyl salicylate were prepared in order to determine the effect of various emulsifying agents upon the dyeing properties and also upon the stability of the emulsions. The following are some of the emulsifying agents used:

Anionic Agents
- Dioctyl sodium sulfosuccinate
- Sodium dodecylsulfate
- Triethanolamine oleate
- Sodium N-methyl-N-oleoyl taurate
- Disodium mono(7-ethyl-2-methylundecyl-4)sulfosuccinate

Nonionic Agents
- Alkylphenols condensed with various amounts of ethylene oxide.
- Refined tall oil condensed with various amounts of ethylene oxide.

Cationic Agents
- Stearamidopropyldimethylhydroxyethylammonium hydroxide
- Tallow amine condensed with ethylene oxide

The amount of emulsifier required to make a good emulsion varied with the material being emulsified and with the emulsifying agent. Results from preliminary experiments indicated that a ratio of one part of emulsifying agent to ten parts of methyl salicylate would give a good emulsion, although as little as one part emulsifying agent to fifty parts methyl salicylate gave good results in some cases. All of these emulsions showed good stability over an 8-hour period. Emulsions of methyl salicylate made with a product produced from a refined tall oil condensed with 16 mols of ethylene oxide and with dioctyl sodium sulfosuccinate were still stable after standing for 3 months.

It is well known that the addition of solubilizing groups or ionizable groups to a dye or carrier renders them ineffective so far as Dacron is concerned. It was also shown recently that, in dyeing disperse dyes on cellulose acetate, dispersing agents have a restraining action in proportion to their solubilizing power *(5)*. In like manner, it was found that the addition of the surface-active emulsifying agent to the dyebath had a leveling effect, but if an excessive amount was used, a considerable loss in color value was experienced. This was probably due to the excess surface-active agent giving the acetate dye and the carrier more affinity for the water phase. This seemed to be particularly true in the case of nonionic agents.

COMPARISON OF ESTERS—— Since emulsions prepared with one part dioctyl sodium sulfosuccinate to 10 parts methyl salicylate had excellent stability and gave good results in the dyebath, a wide variety of esters were emulsified in this manner. The emulsification of liquid esters was easily carried out by vigorous stirring of ester and emulsifying agent in a small amount of water. Solid esters, however, had to be dissolved in a solvent, usually butanol, before they could be emulsified. Two percent dyeings of Calcosyn Blue G (Pr 62) were made with each of these emulsified esters as follows: A 5-g Dacron skein was entered into a 250-ml dyebath containing 2 g of emulsified ester and the dispersed dye. The temperature was raised to the boil, and the material was dyed at this temperature for one hour. The skein was then rinsed, soaped for 5 minutes at the boil in a 0.5% soap solution, then rinsed and dried. The color values of these dyed skeins, shown in Table I, were estimated by several experienced colorists using a dyeing made without carrier as the standard. It can be seen in Table I that dyeings made with any one of several esters had as much as ten times the color value of dyeings made without a carrier. Aromatic esters all gave improved color values, whereas aliphatic esters did not. Mono substitution on the benzene ring of the ester decreased the effectiveness of the carrier in some cases, and disubstitution appeared to decrease the effectiveness still further. It can also be seen that increasing the size of the alkyl group in the ester from methyl to amyl decreased carrier efficiency.

It is well known that benzoic acid and salicylic acid possess carrier action *(7)*. Thus, there was the possibility that methyl benzoate and methyl salicylate merely

TABLE I

RELATIVE COLOR VALUES OBTAINED WITH VARIOUS ESTERS WHEN 2% CALCOSYN BLUE G WAS APPLIED TO DACRON

Carrier 8 g/l in dyebath	*Relative Color Value*
No carrier (Standard)	100
Methyl benzoate	1000
Isopropyl benzoate	500
Amyl benzoate	200
β-Methoxyethyl benzoate	200
N,N-Dimethylaminoethyl benzoate	200
Methyl 2-hydroxybenzoate (methyl salicylate)	1000
Methyl 2,4-dihydroxybenzoate	300
Methyl 2-chlorobenzoate	1000
Methyl 3,4-dichlorobenzoate	800
Methyl 4-nitrobenzoate	1000
Methyl 4-aminobenzoate	300
Methyl 4-tertiarybutylbenzoate	300
Methyl 4-phenylbenzoate	150
Ethyl acetate	100
Amyl acetate	100

Figure 2

Dacron fabric dyed with 2% Calcosyn Brilliant Scarlet BN in the presence of 8 g/l methyl salicylate that was not emulsified

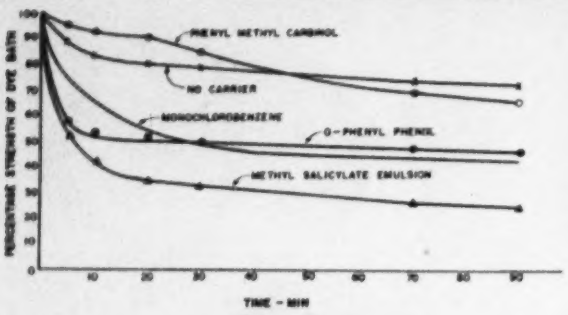


Figure 3
Rate of exhaustion of Calcosyn Blue G at 160°F on Dacron polyester fiber

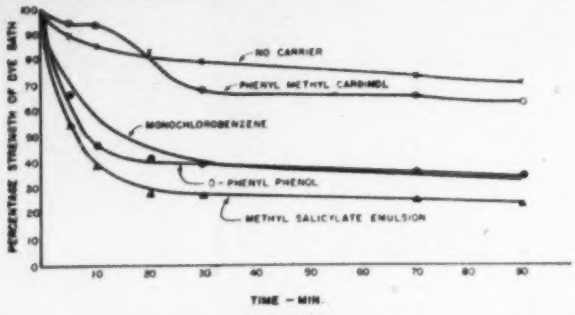


Figure 4
Rate of exhaustion of Calcosyn Blue G at 180°F on Dacron polyester fiber

hydrolyzed and the carrier action came from the aromatic acid. In Table II it can be seen that benzoic acid and methyl alcohol do not possess the carrier action of methyl benzoate in the concentrations used. Furthermore, a mixture of benzoic acid and methyl alcohol does not have the carrier action of methyl benzoate. The carrier action of these aromatic esters is therefore not due to hydrolysis of the esters.

In Table III it can be seen that the methyl esters of polynuclear carboxylic acids were not so effective as the esters of mononuclear carboxylic acids, such as methyl benzoate and methyl salicylate. In Table IV, it can be seen that esters of dicarboxylic acids were much less effective than esters of monocarboxylic acids. From the standpoint of price and carrier efficiency, methyl benzoate and methyl salicylate appeared to be the best of the esters tested.

For this reason the work in the remainder of this investigation relating to esters was carried out with emulsified methyl salicylate.

COMPARISON OF CARRIER EFFICIENCY — EXHAUSTION ——— Dyeings were made to determine the amount of emulsified methyl salicylate required in order to obtain optimum color value. Using methyl salicylate emulsified with dioctyl sodium sulfosuccinate in a ratio of one part emulsifier to 10 parts ester, dyeings were made with several acetate dyes in which the ester concentration was varied from 1 to 16 g/liter. In each case the optimum color value was obtained when the methyl salicylate concentration in the dyebath ranged between 4 and 8 g/l.

Since emulsified methyl salicylate was such an effective carrier, it seemed desirable to compare its efficiency with that of other carriers, particularly those now being used commercially. The first variable studied was the rate of exhaustion. Using two acetate dyes, Calcosyn Blue G (Pr 62), an anthraquinone type, and Calcosyn Orange G Ext Conc (Pr 43), an azo type, the exhaustion rates at 160, 180, and 212°F were compared with the following carriers, the amount of carrier used in each case being that which has been recommended *(3, 4* and *6):*

a) No carrier
b) 20 g per l phenylmethylcarbinol
c) 3 g per l o-phenylphenol
d) 4 g per l emulsified monochlorobenzene
e) 8 g per l emulsified methyl salicylate

TABLE II

EFFECT OF ESTER HYDROLYSIS PRODUCTS UPON THE COLOR VALUE OF DACRON DYED WITH CALCOSYN BLUE G

Carrier 8 g/l in dyebath	*Relative Color Value*
No carrier (Standard)	100
Methyl benzoate	1000
Benzoic acid	100
Methyl alcohol	100
Benzoic acid + methyl alcohol	100

TABLE III

EFFECT OF INCREASING THE SIZE OF THE AROMATIC NUCLEUS OF THE ESTER UPON COLOR VALUE OF THE DYED DACRON

Carrier 8 g/l in dyebath	*Relative Color Value*
No carrier (Standard)	100
Methyl 2-hydroxybenzoate (Methyl Salicylate)	1000
Methyl 2-hydroxy-3-Naphthoate	600
Methyl 2-anthroate	150

TABLE IV

EFFECT OF INCREASING THE NUMBER OF ESTER GROUPS UPON THE COLOR VALUE OF THE DYED DACRON

Carrier 8 g/l in dyebath	*Relative Color Value*
No carrier (Standard)	100
Methyl benzoate	1000
Monomethyl phthalate	150
Dimethyl phthalate	200
Dimethyl terephthalate	150

The dyeing method used in each case was that recommended for the particular carrier and is given in the Appendix. Because of the fact that monochlorobenzene steam distills so easily, it was not possible to make reliable dyeing-rate measurements with it at 212°F. Since acetate dyes are not soluble but are only dispersed in water, it was not possible to make these rate measurements in the Dyeometer. Instead, small aliquots of the dyebath were removed at definite time intervals and diluted with acetone such that the dye was dissolved in a 75:25 acetone-water solution. The amount of dye in the solution was then determined spectrophotometrically. Figures 3, 4 and 5 show the rate of exhaustion of Calcosyn Blue G at 160, 180, and 212°F respectively. Figures 6, 7 and 8 show the exhaustion rates of Calcosyn Orange G Ext Conc at 160, 180, and 212°F, respectively. These show that in general the carriers may be rated in effectiveness in increasing the exhaustion rate from most effective to least effective as follows: 1) methyl salicylate, 2) monochlorobenzene, 3) o-phenylphenol, and 4) phenylmethylcarbinol.

From examination of the exhaustion-rate curves, it appears that dyeings made with the different carriers at 212°F should all be about the same strength since at this temperature they all appear to exhaust about the same amount of dye from the dyebath. However, when the dyed pieces were soaped after dyeing, there was a considerable difference in color value between dyeings made with different carriers. For example, after soaping, the dyeing of Calcosyn Blue G made with o-phenylphenol was only 50% as strong as that made with methyl salicylate and, in addition, it was much duller. This indicated considerable surface dyeing in the case of o-phenylphenol and perhaps poor penetration.

COMPARISON OF CARRIER EFFICIENCY—COLOR VALUE———Since the extent of exhaustion, as shown by exhaus-

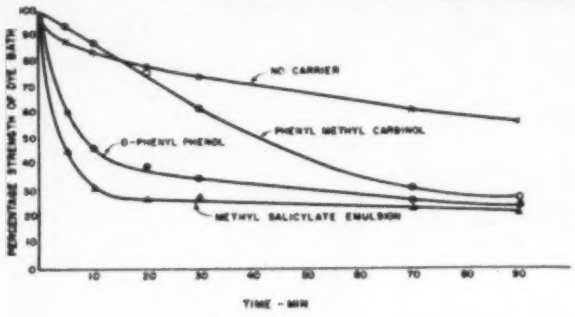


Figure 5
Rate of exhaustion of Calcosyn Blue G at 212°F on Dacron polyester fiber

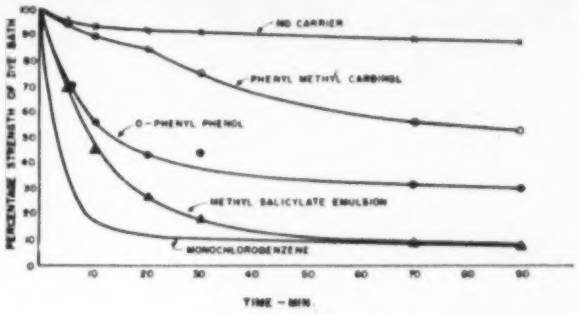


Figure 7
Rate of exhaustion of Calcosyn Orange G Ext Conc at 180°F on Dacron polyester fiber

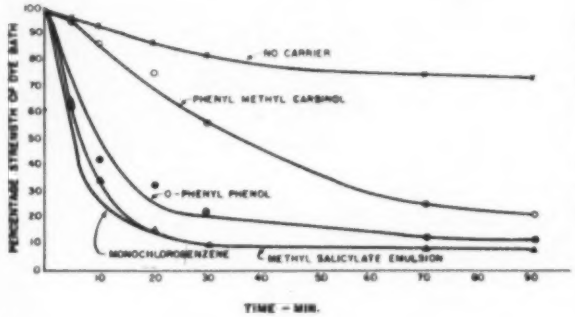


Figure 6
Rate of exhaustion of Calcosyn Orange G Ext Conc at 160°F on Dacron polyester fiber

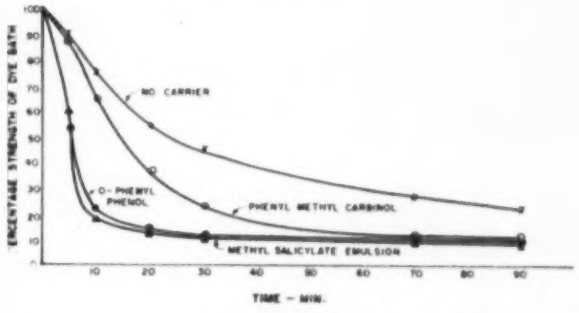


Figure 8
Rate of exhaustion of Calcosyn Orange G Ext Conc at 212°F on Dacron polyester fiber

tion curves, appeared to be of doubtful value in judging the final results, only the color values of final soaped dyeings were considered in the studies that follow. Additional dyeings of a series of acetate dyes were made at 212°F with different carriers and with application of dye by the methods normally recommended for each carrier as described in the Appendix. The results of these experiments are shown in Table V. The color values given are those judged by several experienced colorists using the dyeings made with methyl salicylate as a standard. It was difficult to get an accurate comparison of the color value by reflectance measurements on the spectrophotometer because of the fact that the dyeings made with methyl salicylate were much brighter in almost every case. Some of the carriers produced considerable dulling and also shade changes with certain dyes. It can be seen in Table V that, in most cases, the color value obtained with methyl salicylate was considerably better than resulted from the use of the other carriers.

COMPARISON OF CARRIER EFFICIENCY — DIFFUSION ——— Rate and extent of exhaustion are only a portion of the dyeing process. Dyeing is usually thought of as a two-step process, ie, exhaustion and diffusion. In order to get some idea of the relative diffusion rates, samples of fiber were removed from the dyebath at different stages during the dyeing-rate measurements. They were cross-sectioned and examined microscopically. The results of these tests are shown in Table VI. They show that there are great differences between carriers with respect to their ability to promote diffusion. These results also indicate that some dyes diffuse more readily than others. In

TABLE V
COMPARISON OF COLOR VALUE OBTAINED WITH VARIOUS CARRIERS

Name of Dye	No Carrier	20 g/l Phenyl-methyl-carbinol	3 g/l o-Phenyl-phenol	4 g/l Mono-chloro-benzene	8 g/l Methyl Salicylate
Calcosyn Sapphire Blue 2GS Conc	20	70	80	70	100 (Standard)
Calcosyn Sapphire Blue R Conc	30	80	100	60	100
Calcosyn Blue 2BR Spec Conc	30	100	40	100	100
Calcosyn Brill Turquoise B	15	50	75	50	100
Calcosyn Blue G	20	70	50	50	100
Calcosyn Green 2B	15	50	70	30	100
Calcosyn Orange G Ext Conc	25	60	65	65	100
Calcosyn Orange 3RC Ext Conc	15	70	75	60	100
Calcosyn Orange 2RN	25	90	100	90	100
Calcosyn Orange 6R	15	90	75	80	100
Calcosyn Scarlet GC	10	40	40	30	100
Calcosyn Brill Scarlet BN	10	80	80	65	100
Calcosyn Pink B Double	25	70	70	70	100
Calcosyn Pink Y	25	65	50	50	100
Calcosyn Red GG Ext Conc	10	50	50	50	100
Calcosyn Bordeaux Ext	30	85	85	75	100
Calcosyn Brill Rubine R Conc	10	50	60	40	100
Calcosyn Violet B Conc	15	75	80	75	100
Calcosyn Red Violet R	25	80	75	70	100
Calcosyn Yellow GC Conc	30	85	100	75	100
Calcosyn Yellow 7G Conc	20	40	100	80	100
Calcosyn Yellow MG Conc	40	85	95	50	100

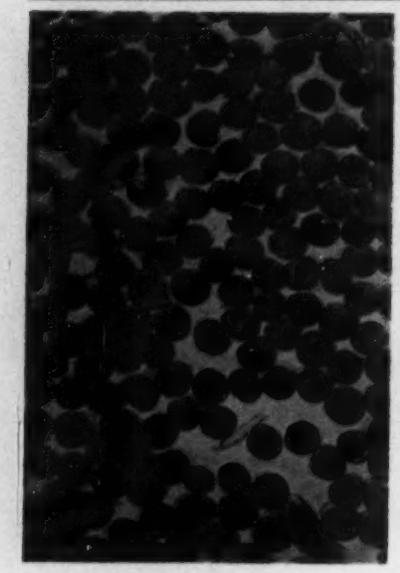


Figure 9

Cross section showing that Dacron is completely penetrated after being dyed for only 10 minutes at 180°F with Calcosyn Orange GC Ext Conc when emulsified methyl salicylate is used as the carrier

every case Calcosyn Orange G Ext Conc diffused into the Dacron fiber faster than Calcosyn Blue G. It is not known at this time whether this is due to the size and shape of the dye molecule, to the degree of aggregation of the dye in the bath, or to other factors. The most unexpected result of these experiments is the extremely rapid and complete penetration obtained at low temperatures with methyl salicylate and monochlorobenzene. It can be seen that, in the case of Calcosyn Orange GC Ext Conc, complete penetration was obtained in 20 minutes at 160°F or in 10 minutes at 180°F with either methyl salicylate (see Fig 9) or monochlorobenzene as carriers, whereas there was almost no penetration after two hours at 160°F with the other carriers. With the slower diffusing Calcosyn Blue G, complete penetration was obtained in 60 minutes at 160°F and in 10 minutes at 180°F (see Fig 10) when methyl salicylate was used. A number of acetate dyes have been applied to Dacron in the presence of a methyl salicylate emulsion. In most cases there was complete penetration in 10 minutes at 180°F and in every case after 20 minutes at 180°F. This seems remarkable in view of the great difficulties that have been experienced previously in obtaining exhaustion and diffusion into Dacron and indicates the possibility of dyeing Dacron at temperatures below the boil.

To determine the effect of longer dyeing times upon color value, dyeings of 15 acetate dyes were made in the presence of methyl salicylate emulsion. Dyeings made for one hour at the boil were compared with dyeings made for two hours at the boil. In every case the one-hour dyeings were equal or slightly superior in color value and equal in fastness properties to those of the two-hour dyeings. Dyeings made for one hour at 200°F in the presence of methyl salicylate emulsion were than found to be equal in color value and fastness to dyeings made for one hour at the boil. Dyeings made at 180 and 160°F were slightly inferior in color value to those made at 200 and at 212°F but were equal in fastness. Dyeings with several acetate dyes were then made in the presence of emulsified methyl salicylate in which the temperature of the dyebath was raised to 180°F in 15 minutes and then dyeing was continued at that temperature for only 15 minutes. Fastness tests revealed that these dyeings were equal in light and wet fastness to those made for 2 hours at the boil.

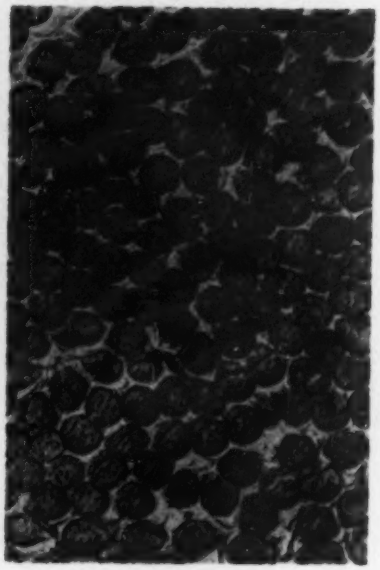


Figure 10

Cross section showing that Dacron is completely penetrated after being dyed for only 10 minutes at 180°F with Calcosyn Blue G when emulsified methyl salicylate is used as the carrier

FASTNESS PROPERTIES——In order to obtain maximum fastness with carriers, such as phenylmethylcarbinol and o-phenylphenol, the dyeing must be scoured thoroughly and in some cases even given an alkaline scour. It was found that this was not the case when methyl salicylate emulsion was used. Dyeings made with methyl salicylate that have not been scoured after dyeing have as good fastness to light as those that have been scoured. Wet fastness is im-

TABLE VI

DEGREE OF PENETRATION OF CALCOSYN BLUE G AND CALCOSYN ORANGE G EXT CONC INTO DACRON AT VARIOUS TEMPERATURES

Time of Dyeing Minutes	Temp of Dyeing °F	No Carrier		20 g/l Phenyl-methyl-carbinol		3 g/l o-Phenyl-phenol		4 g/l Monochloro-benzene		8 g/l Methyl Salicylate	
		Blue	Orange	Blue	Orange	Blue	Orange	Blue	Orange	Blue	Orange
10	160	N	N	N	N	N	N	R	WR	R	R
20	160	N	N	N	N	N	N	R	CP	WR	CP
60	160	N	N	VPR	VPR	N	N	R	CP	CP	CP
120	160	VPR	VPR	PR	PR	VPR	VPR	CP	CP	CP	CP
10	180	N	N	N	N	N	N	CP	CP	CP	CP
20	180	N	N	N	N	N	N	CP	CP	CP	CP
60	180	VPR	VPR	VPR	VPR	VPR	VPR	CP	CP	CP	CP
120	180	VPR	VPR	R	R	R	R	CP	CP	CP	CP
10	212	N	N	N	N	N	R	CP	CP	CP	CP
20	212	VPR	VPR	PR	PR	N	CP	CP	CP	CP	CP
60	212	PR	R	R	R	PR	CP	CP	CP	CP	CP
120	212	NR	WR	MP	CP	R	CP	CP	CP	CP	CP

PR = pale ring; NR = narrow ring; N = no penetration; MP = mostly penetrated; R = ring-dyed; VPR = very pale ring; WR = wide ring; CP = completely penetrated

proved in the case of any carrier by scouring after dyeing because of the removal of loose surface color; however, this need only be a light scour in the case of methyl salicylate. In general, the fastness properties obtained with the different carriers are about equal, provided the dyeings are made properly.

HIGH-TEMPERATURE VS CARRIER DYEING———Another method of increasing the diffusion rate and the amount of dye sorbed on Dacron fiber is to apply the acetate dye at temperatures above 212°F *(9)*. Well-penetrated dyeings of good color value are obtained in this way without the necessity of using a carrier. However specially constructed equipment, much of which is still in the development stage, must be used. Several experiments were made in order to compare dyeings made at high temperatures with those made at the boil in the presence of a methyl salicylate emulsion. Dyeings were made with three acetate dyes for one hour at 250°F using 2% dye in an 80:1 dyebath-to-fiber ratio. These were compared with similar dyeings made at 212°F in the presence of 8 g of emulsified methyl salicylate per liter. Their color values were judged by several experienced colorists, and, in addition, the dye was extracted from the skeins with pyridine and measured spectrophotometrically. The results, shown in Table VII, indicate that more dye is exhausted and greated color value obtained in the presence of methyl salicylate at the boil than is obtained in the same time at 250°F without a carrier. Dyeings were also made in the presence of methyl salicylate emulsion at 250°F, but no advantage was gained by using the carrier at 250°F as compared with 212°F.

Measurements on an Instron tester showed no loss in tensile strength or elasticity as a result of dyeing with methyl salicylate emulsion. A preliminary investigation reveals no toxicity or waste-disposal problem. A light scouring is required to remove the odor of methyl salicylate, although the odor is not unpleasant. Fastness tests have indicated that any methyl salicylate not removed from the fiber after dyeing will have no deleterious effect upon any of the fastness properties.

TABLE VII

COMPARISON OF CARRIER DYEING VS HIGH-TEMPERATURE DYEING

Name of Dye	Dyed One Hour at 250° With No Carrier: % Exhaustion from Extraction Measurements	Dyed One Hour at 250° With No Carrier: % Color Value (Visual)	Dyed One Hour at 212°F With 8 g/l Methyl Salicylate Emulsion: % Exhaustion from Extraction Measurements	Dyed One Hour at 212°F With 8 g/l Methyl Salicylate Emulsion: % Color Value (Visual)
Calcosyn Pink Y	63	80	76	100
Calcosyn Scarlet GC	48	85	66	100
Calcocyn Sapphire Blue 2GS Conc	54	80	76	100

SUMMARY

Some of the work in the development of a new carrier, emulsified methyl salicylate, was described. The carrier action of methyl salicylate was compared with that of phenylmethylcarbinol, o-phenylphenol and monochlorobenzene. By the use of emulsified methyl salicylate, it was shown that better color value and brighter dyeings are obtained with disperse (acetate) dyes than with the other carriers tested. The use of emulsified methyl salicylate in dyeing Dacron with disperse dyes promotes rapid diffusion of the dye inside the fiber, complete fiber penetration usually being obtained in 20 minutes or less at 180°F. Methyl salicylate emulsion appears to be an ideal carrier from the standpoint of toxicity, disposal, residual effect on the fiber, method of utilization and effectiveness at normal dyeing temperatures in regular equipment.

ACKNOWLEDGMENT

The authors wish to express their appreciation to Miss Barbara Gallo, who did much of the experimental work, M J Babey and his staff for fastness determinations, C Maresh and Miss Florence Gustafson for the microscopical and photographic work and Ralph Stanziola for the data on dyeings made at high temperatures.

REFERENCES

(1) Anon, *Chem Week* 74, No. 15, 41 (April 10, 1954).
(2) Anon, *Tech Bull (Du Pont)* 8, 69 (1952).
(3) Anon, *ibid* 8, 99 (1952).
(4) Anon, *ibid* 9, 179 (1953).
(5) Bird, C L, *J Soc Dyers Colourists* 70, 68 (1954).
(6) Choquette, P J, *Textile Research J* 24, 387 (1954).
(7) Turnbull, S G, *Am Dyestuff Reptr* 41, 75 (1954).
(8) Waters, E, *J Soc Dyers Colourists* 66, 609 (1950).
(9) Zimmerman, C L, *Am Dyestuff Reptr* 42, 627 (1953).
(10) Zimmerman, C L, *Calco Tech Bull* No. 826, p 10.

DISCUSSION

Question: I do not recall that you mentioned how the methyl salicylate was emulsified.

Answer: We studied a wide range of emulsifying agents but are not reporting on that work this morning. Our emulsifying techniques were not at all unusual. We merely dissolved the emulsifying agent in the ester to be emulsified, added a small amount of water, and then made a stock oil-in-water emulsion with vigorous stirring, which could be added directly to the dyebath. The exact technique of emulsification did not seem to be important.

Q: Is the type of emulsifying agent important?

A: We have used nonionic, cationic and anionic emulsifying agents successfully. The results obtained vary with the type and amount of emulsifying agent employed.

Q: In what pH range is your method applicable?

A: We have worked with neutral, mildly acid and mildly alkaline solutions. For example, we have dyed Dacron blends with wool satisfactorily, having applied Calcosyn disperse dyes on the Dacron and Calcofast metalized acid dyes on the wool from an acid bath containing emulsified carrier. I believe we have not yet applied vat dyes and disperse dyes from the same bath, however.

Q: Do you want to say something about the mechanism of the action of an ester-type carrier; does it swell the fiber?

A: We are busy working on that problem because we are sure that, if we can determine the mechanism, we can come up with an even better carrier. I do not believe that swelling is an important factor but rather that the dye is soluble in molecular form in the carrier and thus more dye molecules are available in the monomolecular state. Single molecules should diffuse into the fiber more rapidly than dispersed aggregates of dye molecules.

Q: I noticed that most of the dyeings you have shown were in light shades. How about navies and other heavy shades? How does your best carrier compare with the old carriers for heavy shades? Have you used methyl salicylate above the boil to get a navy on Dacron? And how about relative levelness?

A: We have dyed both navies and blacks and apparently have found no limitations in depth of shade with methyl salicylate as the carrier. The photographs of dyeings shown here may be deceptive with regard to depth of shade, but we have produced dyeings as deep in color as anyone would want.

As for the use of methyl salicylate above the boil under pressure, we have tried it up to 250°F but have obtained no increase in color value over that obtainable at 200 to 212°F. Furthermore, the dyeings made at 200 to 212°F with methyl salicylate were in every case stronger than those made at 250°F without a carrier.

With emulsified methyl salicylate as the carrier we have obtained more level dyeings than with any other carrier.

Q: I notice you have used 8 grams of methyl salicylate per liter. Have you tried lower concentrations? I am particularly concerned that, with such a high concentration, you might get unlevel results in package dyeing.

A: We have found that the amount of methyl salicylate for optimum color value was between 4 and 8 g per liter. We may later recommend 4 rather than 8 g for commercial work. Levelness can be gained by control of temperature and rate of addition of dyestuff. As already shown, a lack of sufficient carrier leads to unlevel rather than level results. We have dyed packages in the laboratory and have had no difficulty obtaining level dyeings.

Q: Does methyl salicylate steam-distill at the boil?

A: The answer is "yes". We get complete penetration without loss of carrier, however, by bringing up the temperature slowly to 180°F, holding it there for 10 to 20 minutes, and then raising it to 200°F. The rate of steam distillation is so slight below 205°F compared with that at an active boil that we have no trouble.

Q: According to your curves, the color exhausts as well with o-phenylphenol, but yet you claim you get much better color value with an ester. Where does the color go?

A: We think that when o-phenylphenol is used the dye does not penetrate into the fiber but is merely plated on the outside. The color is removed during the soaping operation. When methyl salicylate is used the dye penetrates the fibers and is not removed by soaping.

Q: What is your experience with navy, forest-green and deep brown shades on lightweight cotton-Dacron piece goods?

A: My paper this morning is based mostly on laboratory and semicommercial experience; we hope soon to get the answers to such questions as yours and to make further progress reports.

Q: Did you use the same emulsifying agent in comparing different carriers?

A: Only two of the carriers described in this paper were emulsified. They were monochlorobenzene and methyl salicylate. These two carriers were emulsified the same way.

Q: Would the use of a real emulsifying agent help the carrier action of ortho-phenylphenol?

A: Not according to our experiments.

Q: Does eight grams of emulsifying agent per liter impair the strength or surface characteristics of Dacron because of the solvent action of 100% ester on that fiber?

A: We have not found any such effect. We have also found absolutely no effect of this concentration on the elasticity of Dacron.

Q: What is the cost of the carrier?

A: We have not yet placed this carrier on the market and cannot answer this question.

APPENDIX

DYEING METHODS

A) No Carrier (10)———The Dacron was entered into the dyebath containing the dispersed acetate dye. A 50:1 dyebath-to-fiber ratio was used. The bath was raised to the boil in 20 minutes, and the material was dyed at the boil for two hours. The dyed material was then rinsed well, soaped at the boil for 10 minutes in a solution containing 0.5 g/l Duponol WA Conc, rinsed, and dried.

In the case of the exhaustion-rate measurements, the temperature was raised to 160, 180, or 212°F, as the case might be, in 10 minutes and dyeing was continued at the desired temperature for the desired time.

B) Phenylmethylcarbinol (4)———The phenylmethylcarbinol was dissolved in alcohol to give a 10% solution and was added to the dyebath so that its concentration in the bath would be 20 g/l. The Dacron was entered into the dyebath containing the disperse (acetate) dye and 20 g/l phenylmethylcarbinol. A 50:1 dyebath-to-fiber ratio was used. The bath was raised to the boil in 20 minutes, and the material was dyed at the boil for two hours. The dyed material was rinsed, soaped for 15 minutes in a solution containing 0.5 g/l Duponol WA Conc and 1 g/l sodium carbonate, rinsed again and finally dried.

In the case of the exhaustion-rate measurements, the bath was raised to the desired temperature in 10 minutes, and dyeing was continued at that temperature for the desired time.

C) Ortho-Phenylphenol (3)———The dyebath was prepared containing 3 g/l ortho-phenylphenol as the sodium salt (Dowicide A) and the dispersed acetate dye. A 50:1 dyebath-to-fiber ratio was used. The Dacron was entered into the dyebath and worked for 5 minutes. Sufficient sulfuric acid was then added to adjust the pH to 3-4. The temperature of the bath was raised to the boil in 20 minutes, and dyeing was carried out at the boil for two hours. The dyed material was rinsed well and then placed in a solution containing 1 g/l sodium carbonate for 30 minutes at room temperature. The Dacron material was then rinsed, soaped at the boil for 15 minutes in a 0.5 g/l Duponol WA Conc solution, rinsed and dried.

In the case of the exhaustion-rate measurements, the bath was raised to the desired temperature in 10 minutes, and dyeing was continued at that temperature for the desired time.

D) Monochlorobenzene (6)——— An emulsion was prepared with one part of dioctyl sodium sulfosuccinate to ten parts monochlorobenzene. The Dacron was entered into a dyebath containing the disperse (acetate) dye and 4 g/l emulsified monochlorobenzene. A 50:1 dyebath-to-fiber ratio was used. The temperature was raised to 180°F in 20 minutes and dyeing was continued at that temperature for 30 minutes. The temperature was then raised to the boil, and the material was dyed at the boil for 90 minutes. It was then rinsed, soaped at the boil for 15 minutes in 0.5 g/l Duponol WA Conc solution, rinsed and dried.

In the case of the exhaustion-rate measurements, the bath was raised to the desired temperature in 10 minutes, and dyeing was continued at that temperature for the desired time.

E) Methyl Salicylate———An emulsion was prepared with one part of dioctyl sodium sulfosuccinate to ten parts methyl salicylate. The Dacron was entered into a dyebath containing the disperse (acetate) dye and 8 g/l emulsified methyl salicylate. A 50:1 dyebath-to-fiber ratio was used. The temperature of the dyebath was raised to the boil in 20 minutes, and dyeing was continued at the boil for two hours. The dyed material was rinsed, soaped at the boil for 15 minutes in a solution containing 0.5 g/l Duponol WA Conc, rinsed and dried.

Atlanta Convention
Printing of Textiles——

PRINTING AND RELATED OPERATIONS ON GLASS DECORATIVE FABRICS*

R F CAROSELLI

Owens-Corning Fiberglas Corp
Ashton, Rhode Island

Glass fabrics, which are mineral in nature and which therefore have the resistance to fire, organism, light and other destructive influences characteristic of stable mineral substances in general, display also those properties of drape, subdued luster and translucency that are necessary for decorative materials. The author explains how the beauty of glass fabrics can now be made complete by printing them with fast-to-light pigments.

As printing glass is very different from printing organic fibers, however, new techniques must be followed. Glass fabrics must first be coronized at a temperature of 1200° F and then be given a protective coating of polyacrylate-latex, containing dispersed Teflon, to receive the print pattern. Oil-in-water or water-in-oil pigment-resin pastes may be used for printing. A curing and the application of a fixative finish to give wash fastness complete the process.

INTRODUCTION

NOT long ago I gave a talk on glass decorative fabrics, in which I ended the discourse with a listing of those properties that make glass the ideal drapery and curtain material. "Where else," I asked, can we find *all* these properties in *one* fabric:

1) Does not burn.
2) Never needs ironing.
3) Easy to clean.
4) Resists soil.
5) Cannot shrink or stretch.
6) Drapes beautifully.
7) Water-repellent.
8) Does not rot or mildew.
9) Not affected by atmosphere gases.
10) Excellent light fastness.

Now, looking back at this wonderful array of properties, I am impressed at how purely functional in approach my analysis was at that time, for, indeed, I had omitted the one property that is all important to any decorative fabric: a decorative fabric must be exactly what the name implies, a decoration, first and foremost. It must be a thing of beauty, and I had not once touched upon this aspect of glass decorative fabrics.

BEAUTY OF PRINTS ON GLASS FABRICS——The topic today is printing, and since printing is perhaps the most important method of imparting decor or beauty to a fabric, I thought it would be nice to atone for my old sin of omission and begin this discussion with the mention of a very distinctive type of beauty which several designers have been able to create by the judicious interplay of two basic physical properties of glass fabrics. I am alluding to the properties of high reflectivity and translucency. Couple these two properties with the opacity of the resin-pigment systems used in printing glass fabrics and the result is a potential in originality of design that is certain to be a designer's delight.

Print on a lustrous ground, for example (as per exhibit), with a delustered, matte, resin-pigment combination, and, under reflected light, we are impressed by a singularly elegant effect not often seen in other fabrics. Now let us permit some light to filter through the fabric. Notice the entirely new effect created as the translucent ground lights up, while the delustered printed area remains opaque but still luminous.

We can also reverse this procedure by delustering the ground with a resin-pigment combination but permit the motifs to remain translucent. Notice the stain-glass feeling this type of decoration produces when light is permitted to flow through the fabric.

There seems to be absolutely no limit to the design effects that can be achieved by letting the imagination dwell on these properties of translucency and reflectivity of the glass and the opacity and luminosity of the pigments.

PROCEDURE STEPS

CORONIZING——But enough of design, let us turn to the technical aspects of creating these printed glass fabrics. The first step, what might be called the preparatory process, is Coronizing. In this process the glass fabric is passed through a muffle oven at a temperature of 1200°F, where all sizing material is instantaneously burned or distilled off, a permanent crimp is imparted to the yarns in the fabric, and simultaneously the glass filaments are relaxed into soft limp fibers giving good drape and hand to the fabric.

PROTECTIVE BASE FOR PRINTING——Since the abrasion resistance of bare glass is rather poor, some sort of protective base for printing must be applied to the fabric at this point. This is done in a pad immediately following the heat-set oven. The search for a proper protective finish for the purpose was a long one, for most materials tested tended to destroy one or more of the ten good properties I mentioned at the outset. Some would sustain a flame; others would ruin our no-ironing story or would impair the draping qualities. Still others that did not impair any of these desirable properties had a poor effect on the adhesion of the subsequent printing paste to the fabric and thus caused the printed cloth to have poor washfastness.

A finish was found, however, that did have all the properties desired, and this is in use today on all properly prepared glass print goods. It consists of a combination of a polyacrylate-latex emulsion with a Teflon dispersion. After the fabric is padded with this emulsion and then merely dried, it is ready for printing. It is well to note here that the Teflon need not be cured, for it is held by the latex in the form of discrete particles in much the same fashion as a pigment would be.

* Presented before the Symposium on Printing of Textiles in the Pompeian Room of the Atlanta Biltmore Hotel in Atlanta, Georgia, on Friday morning, Sept 17, 1954, with Raphael Rupp presiding.

RESIN-PIGMENT PRINTING TECHNIQUES———Printing, both roller and screen, is done with resin-pigment combinations either with a water-in-oil type system or with an oil-in-water type. Screen printers have found the latter more to their liking, and roller printers seem to tend to favor the water-in-oil, although both have been known to be successful with either type of printing if they employed the techniques peculiar to each system.

Not all resin-pigment systems adhere well to glass, and to date we recommend only two commercially known systems. One, the water system, is based on epoxy-resin emulsions, while the oil system we recommend is based on a latex emulsion. Both give equally satisfactory printed glass, but no system has been found which does not depend on a subsequent after-treatment for washfastness. As a matter of fact, our base print finish itself would wash out if not aftertreated. Thus, all printed glass fabrics need finishing before they can be marketed.

FINISHING———The first step in the finishing procedure is the curing of the printed goods. This is done at a temperature of 300°F for 3-5 minutes with the goods in an open, flat condition. A frame is not recommended, but if circumstance demands framing, then care must be taken to belly out the fabric all the way through the frame to prevent tearing the selvages.

The second step is to pad the cured fabric through a 5% aqueous solution of stearate-chromic chloride. This is the chemical that imparts washfastness to the fabrics. Pad pressures are adjusted to give a 25-30% wet pickup. Care should be taken to prevent bubbles or ripples in the fabric from entering the nip, as these might cause cracks in the goods.

The fabric should pass directly from this pad to a cure-box, where again the fabric must attain 300°F.

For best hand and drape a soaping for 5 minutes in a rope soaper or in an open soaper with a mild detergent at 120°F is recommended. Again, caution must be taken at nips to prevent cracking. Nip drives should be avoided whenever possible.

CONCLUSION

I feel confident that any printer represented in this group this morning would have no trouble mastering the printing of glass fabrics. Except for making allowances in handling for the no-stretch property of glass and for exerting great care to avoid the cracking of goods at nips, the processing of a printed glass fabric does not entail any new or extraordinary techniques that are not now widely used in the resin-pigment printing of any organic fiber.

Leonard Shapiro, Polyco Dept, Borden Company Chemical Division, discusses "Recent Developments in the Use of Polyvinyl Alcohols"

Western New England Section Meeting

•

JANUARY 28, 1955

•

RAPP'S RESTAURANT
Shelton, Conn

At the head table (l to r): Leonard Shapiro, guest speaker; Socrates V Vaniotis, chairman; Raymond W Jacoby, AATCC president; Thomas J Gillick, Jr, treasurer (standing); and Nathaniel J Glade, vice chairman

Photos by A N Henschel

ABSTRACTS

Physics in the Dyeing, Printing, and Finishing Industries

N W Yelland, *J Soc Dyers Colourists* 70, 333-46, August, 1954.

The applications of physics in the various operations of textile processing are reviewed by the author. The field for such applications includes the study of the physical properties of textile products *en masse* in their finished or semifinished state; the investigation of the fundamental properties of textile fibers; the study, measurement, and control of the physical factors that govern the operation of finishing processes; and the invention of new machines and processes, which involves keeping in touch with the latest discoveries and inventions in pure and applied physics.

Among the individual topics discussed by the author are color and luster measurement, the drape and hand of textiles, their thermal and electrical properties, the physical properties of the individual fibers, drying efficiency, measurement of the moisture content and stretch of running cloth, light integrators for use in testing lightfastness of dyes, mathematical methods for measuring the area of each color in a printed pattern, and the application of optical instruments in printing, the microscope in particular.

While the British Standards Institution recognizes daylight as the only standard of illumination for testing colorfastness to light, the author comments that the enclosed carbon arc is widely used for this purpose in England.

Eighteen references to the literature are cited.—WHC

Preparing Water-Soluble Naphthols for Dyeing Wool

Rath and Fees, *Textilber*, p 267-9 (1954).

Many prior methods for solubilizing naphthols while avoiding excess alkali are mentioned. It has been observed that the introduction of solubilizing groups into the Naphthol AS molecule (cf Ger Pat 478,331/I G Farben), for instance, by forming an arylide of betaoxynaphtoic acid with aniline-m- or p-sulfonic acid, does not render a treated product sufficiently wash fast. Another process, based on the transformation of naphtholates by acid-formaldehyde solutions into the corresponding methylol compounds and subsequently with carbon disulfide into soluble xanthogenates, seems to be rather of theoretical interest. Among other references mentioned by the authors is a process covered by French Patents 764,700 and 768,526, based on the use of specific azo dyes capable of forming insoluble lactames upon acid treatment, due to the positions of the carboxy and amino groups.

The authors have developed two new methods. The first calls for reacting acetobromoglucose with naphthol in the presence of quinoline and silver oxide. Glucosides obtained this way are of limited solubility (7 g/l), and decomposition on the fiber is effected by a treatment with warm dilute sulfuric acid, whereupon coupling is performed with diazonium salts. Properties of these dyeings reportedly are satisfactory, but rather high amounts of sulfuric acid are required.

A second method, using the potassium salts of acid sulfuric esters of the Naphthol AS compounds, may be preferable. The general procedure is to sulfonate a slurry of the naphthol in dimethylaniline by adding chlorosulfonic acid dropwise, then stirring the resultant acid ester with KOH, whereby dimethylaniline settles out. The products are said to be quantitatively absorbed by wool from acetic acid dyeing baths like acid wool dyes. Upon treatment with 10 g sulfuric acid per lit and subsequent rinsing with dilute ammonia the naphthol deposited within the fibers is ready for coupling with a diazonium salt. Since the regenerated naphthols formed by splitting the potassium ester salts tend to crystallize, thereby impairing the coupling reaction, it is advisable to retard crystallization by applying specific agents, eg, formaldehyde. This method can be used accordingly for dyeing natural silk, polyamide fibers and cellulose acetate. —PW.

Survey of Processes for Preventing Felting of Wool

Ford, *Textilber*, p 279-81, March, 1954.

Hypochlorous acid acts as an antifelting agent predominantly in a pH range of 2-8.5, while this effect decreases quickly at higher pH values. This phenomenon is said to be based on the fact that the nondissociated acid is responsible for the reaction, while the hypochlorite ion present in the alkaline range has no substantial effect.

Hypobromous acid, having a lower dissociation constant than hypochlorous acid, could be assumed to have a better effect at a higher pH, thereby avoiding fiber damage which is known to occur from the use of hypochlorous acid under acid conditions. Actually Trotman and Bell [cf *J Soc Chem Ind*, 30 T (1935)] have observed that bromination of wool impairs wool fibers to a lesser degree than chlorination.

The second part of this article discusses the Stevenson-Raynes process [USP 2,429,082, cf *Am Dyestuff Reptr* 37, 383 (1948)] comprising the combined action of permanganate and hypochlorite. This process has been studied under varied conditions. It has been found that a pretreatment with *permanganate preceding chlorination* produces a good antifelting effect, while inversely, an aftertreatment with permanganate does not show improved results. MnO_2 in itself has no catalytic effect on the subsequent reaction with hypochlorite. Varying the pH value of the permanganate solution down to 4.5 has no substantial influence.

Some experiments have been carried out with ozone as an antifelting agent, and it is assumed that this method may have great technical interest. The effect here depends largely on the moisture content of the fibrous material; 17-20% moisture seems to be the optimum condition.—PW

Continuous Dyeing of Indigosols*

Speiser, *Textil Rundschau*, p 602-13, November, 1953.

The author presents a very valuable detailed report on the subject, dealing especially with practical problems occurring in this field. The current continuous process consists of impregnating with the alkaline solutions of the ester salts mixed with an oxidizing agent, squeezing, briefly skying, souring with hot dilute sulfuric acid, exposing again to air and immediately cold rinsing, removing residual acid in a soda-ash bath and soaping at the boil.

The method requires only simple equipment, while avoiding any steam (aging) treatment. Additional advantages include good penetration caused by low substantivity of the dyes, and stability of the baths. On the other hand the process is more expensive as compared with customary vat-dyeing processes, and darker shades — except navy colors — cannot be easily obtained.

Suggestions are offered for the preparation of the slightly alkaline dyestuff solutions and for construction of the dyeing equipment, which consists of different types of padders, such as the Haubold, the Zittau and the "Fibe" (Benninger) padding mangles. Schematical drawings of these types are offered. Compensating

* The term "Indigosols" comprises all kind of sulfuric acid ester salts of leucovat dyes regardless of their provenience.

rollers, inserted between the padding and the developing bath, have to be run slowly and smoothly so as to avoid streaks. Impregnated fabrics must be processed without interruption so as to avoid irregular results which may be caused by differences of temperature at the center portion of the fabric roller and the outside layers, or especially by reason of sensibility to light rays.

Two tables refer to results obtained in soaping at the boil, involving a large series of light and medium Indigosol dyeings; differences are noted in treatments ranging from 15 seconds to 15 minutes. Since the soap treatment *in continuous processes* is restricted to a relatively short time, these figures are of special interest. Some of the Indigosols require 15 seconds only, while others require one, five or fifteen minutes' soaping for complete development.—PW

Identifying Polyvinyl and Polyacryl Compounds in Textile Analysis

Rath and Heiss, *Textilber*, p 536-540, May, 1954.

Many vinyl, acryl and methacryl homopolymers or copolymers are used in current practice as finishing compounds and as fiber constituents. Analytical methods for identification as described in literature are not specific. A new method for identifying these products is proposed which is based on transforming them into *polyenes* by a splitting-off process of halogen, hydroxy or alkoxy groups. The schematic equation as given by the authors follows:

$$\cdots - CH_2 - \underset{Cl}{CH} - CH_2 - \underset{Cl}{CH} - \cdots \xrightarrow[Light]{Heat} \cdots - CH = CH - CH = CH - \cdots + 2\ HCl$$

The authors observe that hydrochloric acid (also acetic acid, when copolymers are present) can also be split off by certain alkalies in the presence of water-absorbing agents. Conjugated polyenes of yellow-to-brown-to-black color (according to different chain lengths) are formed. In the carrying out of the test, the dilute vinyl polymer solution is dropped on a filter-paper strip; after the strip is dried and subsequently treated with an alcoholate solution, eg, sodium methylate or sodium butylate, the spots appear in yellow, red or dark brown color.

Polyvinyl ethers are better split with *phenyl lithium*. Upon the addition of this compound to the polymer solution in ethyl ether or tetrahydrofurane the shade turns from blue over purple to black. Finally a black jelly settles out. The following equation explains the decomposition of the Li-substituted polyvinyl ether:

$$- \underset{OCH_3}{CH} - \overset{Li}{CH} - \underset{OCH_3}{CH} - \overset{Li}{CH} - \longrightarrow - CH = CH - CH = CH - \cdots + 2\ CH_3OLi$$

Phenyl lithium also reacts with vinyl chloride or vinyl acetate copolymers, therefore qualifying as an appropriate universal testing agent. A table illustrates color reactions of various vinyl polymers.

Another part of this article is devoted to a full description of corresponding reactions of polyacrylo or polymethacrylo compounds and to a test for the split alcoholic component (modified Zeisel method) by determining the melting point of the esters. Finally suggestions are offered for carrying out the analysis on finished textile materials.—PW.

Characteristics and Object of Pigment-Printing Processes

Cramer, *Textilber*, p 523-7, May, 1954.

The advantages of modern emulsion-pigment-printing methods in the screen- and roller-printing techniques are discussed and results compared with those obtained in older standard printing procedure.

Although fixation is rather independent of the nature of the substratum, some influence of the specific fibers should be noted. Inorganic pigments may give somewhat better results as far as softness of the prints is concerned while greater brilliance can be expected with organic dyestuff pigments. A very complex problem is to find the appropriate binder, which is generally applied in the form of a dispersion or emulsion in a two- or three-phase system. Another difficult problem is encountered in selecting the correct quantity of the binder so as to avoid undue stiffness of the fabrics. The use of shallow engravings in machine printing and fine gauze screens combined with the least possible number of passages of the doctor blade in screen printing are suggested to reduce the bulkiness of the colored layers. Here the surface of the fabric, whether absorbent, hydrophobic, smooth or glass-like, is of special importance. Indifferent materials such as chromed copper rollers and natural silk screens, are obviously best.

Some general remarks are devoted to the prospects of pigment printing and to the question of printing *exclusively* pigments of different color in multicolored patterns. It is concluded that increasing development of this modern technique can be expected by reason of the very simple application methods; however, the printer should be aware of the limits inherent in these processes.—PW

Dyeing at Temperatures Over 100°C

Justus, *Textilber*, p 1146-51, December, 1953.

The author gives a brief survey of the pertinent literature [eg, *Textile Research J 18*, 598 (1948) and *Am Dyestuff Reptr 39*, 250 (1950)] discussing the influence of high-temperature dyeing on various fibers and dyestuff classes.

Direct dyes can be used well on cellulosic fibers; the affinity of these fibers, especially rayon, *decreases* generally above 100°C. The leveling properties of direct dyestuffs of high water fastness, such as Sirius Light Gray VGL, are improved at 120°C. Under these conditions the dye migrates easily from the dyed material to nondyed fibers while at 90°C substantially no dyestuff exchange between dyed and white fibers occurs. This property is especially useful in apparatus dyeing of strongly swelling fiber material such as rayon, which ordinarily requires 6 hrs at 90°C for good penetration, but only 1-2 hours at 115-120°C, as do the principal direct dyes.

Studies regarding the dyeing of vegetable fibers with vats show that the improved leveling effect corresponds more or less to that observed in direct dyeings. Many vat dyes show a maximum affinity at 60-70°C and migrate back into the bath at 80°C, thus it might not be necessary to use temperatures above 100°C. Moreover, only few vat dyestuff brands can stand more than 110°C.

In dyeing wool with acid dyes the main difference is the linking of the dyestuff to the fiber in a chemical reaction rather than by simple adsorption. Since chemical reactions quite generally are speeded up by increased temperatures it is interesting to note that exhaustion requires one hour at 98°C, 15-20 min at 110° and 10 min at 115°C. Accordingly exhaustion is completed in much less time using chrome dyes, but leveling out of these dyeings is not substantially improved in these short periods at 105-110°C and it can be attained only by extending the dyeing procedure to one hour. The tensile strength of the fibers is impaired considerably at 115°C. Chrome-dyed fibers show better tensile strength in short-time dyeing at elevated temperatures than in the one-hour standard dyeing process at 98°C.

Many advantages on dyeing Orlon, nylon and Dacron (referring particularly to the article by Meunier and Thomas in *Am Dyestuff Reptr 38*, 925 [1949]) are briefly reported. The author concludes that high-temperature dyeing of all types of fibers generally gives very favorable results.—PW

Washfastness of Resin Finishes

Sorkin and Ernst, *Textil Rundschau*, p 23-4, January, 1954.

Creaseproof, shrinkproof and embossing effects that are based largely on urea- or melamine-formaldehyde condensates vary in washfastness. Quantitative determination of the durability of the effect appears to be very interesting.

The authors propose the use of an acid-scouring process, which is said to give reliable testing results in three steps. *First*, the water-soluble substances have to be removed from the fabric by a treatment in 90°C water for 5 minutes, followed by squeezing and thorough drying at 140-145°C; *secondly*, treating for 3 minutes at 60°C with 3% hydrochloric acid, followed by rinsing for 2 minutes in running water; and *thirdly*, treating in 3% hydrochloric acid for 6 minutes, followed by rinsing, drying and weighing.

Figures are presented corresponding to the amounts of resins which are removable with ease or with difficulty respectively, while a table compares the different finishes. The greatest wash fastness apparently is obtained with highly etherified melamine-formaldehyde condensates.

It is suggested that this method may be used in modified form to determine the wash fastness of other nonresinous finishes.—PW

Mechanized Screen-Printing Processes

Franken, *Textil Rundschau*, p 656-63, December, 1953.

This article begins with a review of the history of screen-printing methods. The first attempt to produce prints by applying the color paste through patterns cut out from paper, cardboard or metal sheets was made in Japan. These prints, termed "Yuze," were produced on an artistic rather than an industrial basis. Promising results could only be attained by using sieves or nets, primarily made of silk gauze, on which the negative of the pattern had to be permanently fixed. The development of a new printing method in addition to the well-known roller print and block print methods became necessary, as roller prints became increasingly less profitable since great yardages could no longer be obtained. Screen printing could usefully be applied besides machine printing and the highly expensive block-printing techniques.

The author gives a comprehensive survey of progress made in mechanizing screen printing, first by producing screens by photographic means; further by developing transport carriers for the screen frames, particularly for bringing the frames speedily into the proper working position; and finally, by using special devices for pasting the fabrics on the tables and for subsequently cleaning the latter by rinsing. Different systems of completely automatic screen-printing devices, including mechanically driven doctors, are described and one of them (the Swedish system "Teximpex") is illustrated. Continuous handling of screen-printed fabrics can be effected by using a special ager wherein staining of the transport rollers by relatively thick layers of printing paste can be avoided.—PW

Application of Carboxymethylcellulose in the Textile Industry

O Wurz and E Wurz, *Textil Rundschau*, p 557-60, October, 1953.

Carboxymethylcellulose ("CMC"), which is widely used as a finishing material, is marketed under different tradenames in many countries. The authors describe particularly an Austrian brand, "Polyfibron B or BN," manufactured in a Styrian factory. The pH of a 1% solution of "B" is given as 12, and that of the neutralized product "BN" as 7. The properties of these products, such as viscosity, solubility, stability against hydrolizing agents, etc, are reported.

Nonpurified carboxymethylcellulose can be used for sizing and finishing processes for vegetable fibers and for wool (especially in admixture with different cellulose ethers). Purified, salt-free products are recommended for thickeners in textile printing pastes containing direct, acid or vat dyes. The latter should be blended with starch thickeners to avoid gelling. One of the authors has observed that traces of Fe or Mn, sometimes present in these products, are responsible for forming precipitates with sulfur dyes. Surprisingly, these metal traces were found in lesser amounts in carboxymethylcellulose than in gum tragacanth, which does not show this coagulating reaction. It is concluded that this phenomenon, which occurs in "Polyfibron" compositions only, might be caused by a specific catalytic-oxidative force of the metals. It is suggested that they could be rendered inactive by a treatment with a sequestering agent, especially with nitrilo-triacetate of sodium ("Aquamollin," Cassella).—PW

Physical Measurements of Printing Thickeners

Schmidt, *Textilber*, p 177-83, February, 1954.

An interesting study concerning a test for thickening agents in order to correlate their physical properties with the end effect in printing textiles is offered. The author investigates the characteristic properties of thickeners, ie, their influence on the precision of the outlines, color penetration, levelness of the printed areas and physical conditions of the paste responsible for these effects, comprising principally viscosity, surface tension and stringiness.

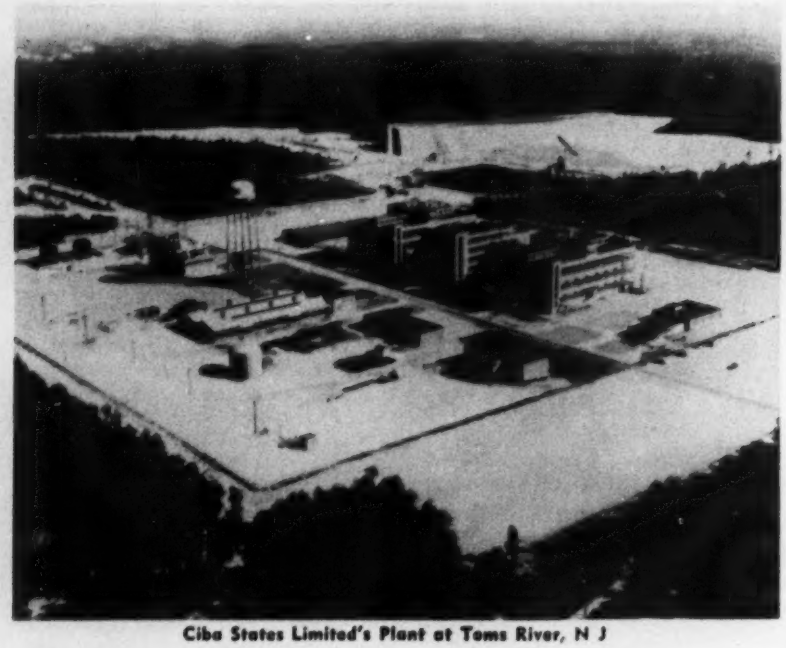
It is not easy to find a scientific standard for levelness in itself, but the exact outlines of the prints seem to be a characteristic feature of the uniform consistency of the paste; this factor can be measured by stencil-printing the colored paste in a pattern consisting of concentric rings, arranged in gradually decreasing distance from one another. Distinct sharp outlines in all of the (four) rings are characteristic for the best printing behavior while unsatisfactory consistency of the paste causes flowing of the color over the white spaces between the rings. Thus blotting out one or the other of the white spaces gives a reproducible standard for the fitness of the paste.

Other suggestions regarding measurement of the stringiness ("Zuegigkeit") and viscosity by known methods are presented and illustrated and valuable scientific comments are added. The author considers measurement methods of this type as a starting point only and as a basis for conclusions in the textile-printing practice.—PW

Back numbers of American Dyestuff Reporter less than two years old may be obtained from Howes Publishing Co, Inc, 44 East 23rd Street, New York 10, N Y, and earlier numbers from the Secretary, American Association of Textile Chemists and Colorists, P O Box 28, Lowell, Massachusetts.

Prices postpaid: 50 cents each to nonmembers of AATCC, 35 cents to members; complete volumes $5.25 to nonmembers, $4.50 to members.

News of the Trade



Ciba States Limited's Plant at Toms River, N J

• CCW to Purchase Ciba's Toms River Plant

Dr Robert Kaeppeli, managing director of Ciba Ltd, Basle, Switzerland, and president of Ciba States Ltd, has announced the following:

"Cincinnati Chemical Works, Inc, Cincinnati, Ohio, will in the near future purchase the vat dye plant recently built and put into operation at Toms River, New Jersey, by Ciba States Limited.

"Since 1920 Cincinnati Chemical Works, Inc, has been owned by the three Swiss dyestuffs manufacturers, Ciba Limited, J R Geigy, S A, and Sandoz, Limited, all in Basle, Ciba having the controlling interest. The products of the factory are supplied to the American subsidiaries of the Swiss firms.

"Ciba Limited, which has a world-wide reputation as a manufacturer of vat dyes, has contributed the whole wealth of its experience in this field to the building of the Toms River plant and will continue to place its scientific resources and technical know-how unreservedly at the disposal of that plant.

"This new organization backed by intensified scientific and technical support on the part of the three Swiss firms with their wide experience in the manufacture of dyestuffs will lead to a considerable increase in productivity and make available to the consumer industries new and important products."

OBITUARY

JAMES R REDMOND, 40, vice president and New England District manager of the Textile Colors Div, Interchemical Corp, died on April 9th at Providence, R I, after a short illness.

Mr Redmond was born in Lowell, Mass. Following his graduation from Lowell Technological Institute in 1936, he joined Ciba Co, Inc. During World War II he served with the U S Army Quartermaster Corps. He became affiliated with Interchemical in 1945.

He was a member of AATCC; the American Chemical Society; the Quartermaster's Association; the Providence Society of Financial Analysts; the Lowell Lodge, BPOE; and the Pawtucket Country Club.

James R Redmond

• J W Ivey Forms New Company

Jasper W Ivey, who for the past ten years has served as vice president and director of sales of The Moreland Chemical Co, has resigned in order to organize the Ivey Chemical Company of Greenville, S C.

A modern warehouse for the new company is now under construction by Daniel Construction Company on property near the Laurens Highway and By-Pass Highway #291. It is expected to be completed before June 1st.

The Ivey Chemical Company has been organized for the distribution of a complete line of industrial chemicals, principally for use in textile processing and water treatment.

• Merchant Products Corp Absorbs IOPC

Following a recent meeting of the board of directors of Merchant Products Corp, Philadelphia, Pa, it was announced that the Industrial Oil Products Corp has been liquidated and its operations absorbed by MPC.

The following were unanimously elected to head the new organization: Fred E Loud, chairman of the board of directors; S Nelson MacFaul, president; Carl M Obeck and James D Hancock, vice presidents; R E Erickson, treasurer; H L Zoerner, secretary; and John R Jones, Jr, asst treasurer and secretary.

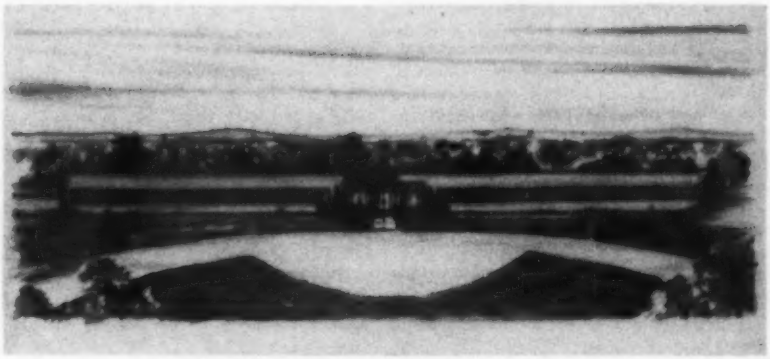
All operations for both Corporations will continue as heretofore.

• ALCA Annual Meeting

The American Leather Chemists Association will convene at Swampscott, Mass, next month for the 1955 Annual Meeting at the New Ocean House.

The 4-day affair will begin on Sunday, May 25, with the traditional Presidential Reception slated for 6 pm. Technical sessions will be held on Monday and Tuesday, while Wednesday will be devoted to a full day's discussion of leather-making processes.

Other features of the Meeting will include a bus trip to Lowell Technological Institute for an inspection of the Leather Engineering Department, the annual banquet on Tuesday evening, and various social events, including a barn dance and golf tournament.



Artist's conception of new Macbeth plant

• Macbeth to Erect New Plant

The Macbeth Corporation and Subsidiaries, Newburgh, N Y, engineers and manufacturers of daylight lamps for critical color matching, colorimeters, pH meters and electronic instruments, have awarded a contract for the erection of a new plant in Newburgh to Fred J Brotherton, Inc.

The new plant will be a one-story structure of modern functional design with a frontage of 240' and a depth of 142'. The new facilities will enable Macbeth to install new machinery which will allow them to manufacture parts which heretofoe have been subcontracted, and permit more efficient operations.

The building, engineered and designed by Lockwood Greene Engineers, makes provision for expansion as needed without altering the frontal appearance. Occupancy is expected by September 1st.

• Jacobson to Head GDGA

Lawrence Jacobson, Lawrence Jacobson Dye Works, Philadelphia, was elected president of the Garment Dyers Guild of America during that organization's annual meeting last month in Milwaukee. Irving Duffen, Duffen Dye Works, Portsmouth, Va, was elected to serve as vice president, and Mrs Lucien Dietrich, Dietrich Dyers, St Louis, will serve as secretary-treasurer.

The meeting was preceded by a clinic at the plant of the Kran-Mer Corp in Milwaukee, where latest techniques and developments in the garment dyeing industry were discussed. Particular emphasis was placed on the dyeing of fabrics made from the newer synthetics as well as the improvement of quality of the finished product.

Among the items of business was the appointment of a public relations committee, which will survey the possibilities of nationally promoting dyeing with the public consumer through media such as radio, television, newspapers, magazines, trade journals, news and pictorial services.

About fifteen member plants were represented at the meeting, as well as tradesmen and members of the press.

• Hold Colorfastness to be Chief Consumer Concern

Colorfastness is the most important question in the minds of consumers when buying soft goods, according to the results of a nationwide trade survey just completed by American Cyanamid Company.

Asked, "What questions do consumers ask first when buying soft goods", store buyers and merchandise managers checked, "Will it fade?" as the most frequent (29.64%), even ahead of "What is it made of?" (28.56%), or "How much does it cost?" (26.64%). Less than ten percent checked, "Who manufactures it?" (9.67%).

"A number of other startling revelations were made in answer to our questionnaire, sent to over 33,000 buyers and merchandise managers in U S department and specialty stores", J L Naylor, manager of the American Cyanamid's Dyestuff Department, said in releasing the survey returns.

"Our response of approximately 10% was very gratifying, especially in view of the depth of many of the questions asked. It makes our survey, so far as we know, the most comprehensive of its kind ever made on color problems at the retail level. We feel we now have a new and accurate picture of prevailing attitudes and understanding about dyes among retailers and the general public".

The seriousness of the problem of color failure is disclosed in the returns showing that color fading, running or rubbing off brings merchandise returns to over 83% of the stores reporting. It is revealed that the degree of this problem varies in specific merchandise categories. Among the worst areas are curtains, draperies and upholstery, say 38.64% of store respondents; dresses, 39%; blouses, skirts, sportswear, 31%; knitwear, 27.5%; slip covers, bedspreads, 27%; sport shirts, 23.6%; corduroy products, 20%; pajamas, 18%.

Indicating store headaches due to color failure in piece goods was the heavy response on recurring returns in the four fabric classifications listed: rayon, 34.7%; cotton, 25.5%; synthetics, 21.8%; blends, 18.4%.

Retail stores bear the brunt of consumer ill-will in cases of color failure, say 3 out of 4 retailers. Although "manufacturer" was checked by most of the balance, there was a write-in vote of "both" (store and manufacturer) by 12.17% of respondents.

The question that was answered by 100% of the respondents dealt with vat-dyed identification by manufacturers. All want the manufacturer of merchandise made of vat-dyed or vat-printed fabrics to state in his advertising, tags, mats for store advertising, and display material that the fabrics are colored with vat dyes. An overwhelming percentage of retailers, the survey shows, feel that an extensive public and trade education program on vat dyes would help both store and consumer.

"Perhaps most interesting to us", declared Mr Naylor, "was the response to the question on the justification for a slightly higher retail price on vat-dyed merchandise. More than 95% of the buyers and merchandise managers queried felt the colorfastness feature important enough to justify the difference in price. Less than 5% checked 'No'.

"Since it has been reported to us repeatedly that mills and cutters can't get the slight extra price required for vat-dyed or vat-printed merchandise, retailer response to this particular question has special significance. Although the American Cyanamid Company, a leading producer of vat dyes, direct dyes and pigments for cottons, viscose rayons and linens, has long felt the preference trend toward vat dyes, this current survey leads us to believe that the trend will be accelerated with the obviously growing demand on the part of both retailers and consumers for colorfastness", Mr Naylor concluded.

• Alcolac Reduces Sipon Prices

American Alcolac Corp, Baltimore, Md, has announced price reductions on all of its products in the Sipon line, the first in more than two years.

All Sipons in tank-trailer loads have been reduced one and one half (1½) cents per pound and one (1) cent per pound in truck loads and drums.

• Mutual Adds to Baltimore Property

Mutual Chemical Division, Allied Chemical & Dye Corporation, has purchased an additional four acres adjoining its present Baltimore works.

The new property was acquired from F Bowie Smith, a Baltimore lumber operator.

• 1955 Gordon Research Conferences

Under the sponsorship of the American Association for the Advancement of Science, the Gordon Research Conferences will be held this year from July 11th through 15th at Colby Junior College, New London, N H.

The Conferences were established to stimulate research in universities, research foundations and industrial laboratories. This purpose is achieved by an informal type of meeting consisting of the scheduled lectures and free discussion groups. Sufficient time is available to stimulate informal discussions among the members of a Conference. Meetings are held in the morning and in the evening, Monday through Friday, with the exception of Friday evening. The afternoons are available for recreation, reading, resting, or participation in discussion groups. This type of meeting is designed to encourage dissemination of information and ideas which otherwise would not be realized through the normal channels of publication and scientific meetings. In addition, scientists in related fields become acquainted and valuable associations are formed which result in collaboration and cooperative effort between different laboratories.

It is intended that each Conference will extend the frontiers of science by fostering a free and informal exchange of ideas between persons actively interested in the subjects under discussion. The purpose of the program is not to review the known fields of chemistry, but primarily to bring experts up to date as to the latest developments, analyze the significance of these developments, and to provoke suggestions as to underlying theories and profitable methods of approach for making new progress. In order to protect individual rights and to promote discussion, it is an established rule of each Conference that all information presented is not to be used without specific authorization of the individual making the contribution, whether in formal presentation or in discussion. No publications are prepared as emanating from the Conferences.

The first meeting of each Conference is held Monday morning at 9 am. The morning sessions, through Friday, are scheduled from 9 am to 12 noon. The second session of each day is held in the evening from 7:30 to 10 pm, Monday through Thursday. There are no Friday evening meetings. Conference members are expected to release their rooms not later than Sunday morning unless they have made a reservation for the next Conference.

Accommodations are available for a limited number of women to attend each Conference, also for wives who wish to accompany their husbands. All such requests should be made at the time of the request for attendance because these limited accommodations will be assigned in the order that specific requests are received. Children twelve years of age and older can be accommodated.

Individuals interested in attending the Conference are requested to send in their applications to the Director. Each applicant must state the institution or company with which he is connected and the type of work in which he is most interested. Attendance at each Conference is limited to 100.

Requests for attendance at the Conferences, or for any additional information should be addressed to W George Parks, director, Department of Chemistry, University of Rhode Island, Kingston, R I. From June 10 to September 2 mail should be addressed to Colby Junior College, New London, N H.

J B Goldberg will serve as chairman of the Conferences on Textiles with G R Seidel serving as vice chairman.

The program for Textiles follows:

July 11———"Cotton Fiber Properties in Relation to Processing and Product Quality", H Wakehan; "Bleachability and the Bleaching of Off-Colored Cotton", C Harmon and S Simon.

July 12———"The Chemical Modification of Cotton by Cyanoethylation", J Compton; "A Copper Process for Permanent Microbiological Protection of Cellulosic Fabrics", E Abrams.

July 13 ——— "Fiber Characterization by Electron Microscopy", R G Scott; "Some New Aspects on Static in Textiles", S M Edelstein.

July 14———"Progress in Man-Made Protein Fibers", J S Gillespie, Jr; "The Influence of Molecular Structure on Cellulose Acetate Fiber Properties", H K Hughes.

July 15———"Protection Afforded by Textiles and Clothing Against the Thermal Effects of Atomic Weapons", S J Kennedy.

Executive and sales representatives for National Adhesives (Canada) Ltd and National Starch Products Inc (US) recently held a joint meeting in Toronto to exchange ideas and sales techniques, as well as to discuss new products, types of applications and new adhesive outlets.

Heading the delegation from the United States were Don Pascal, National Starch's sales vice president, and Jim Dillon, vice president of the resin division.

One of the features of the round table discussion was a characterization by the various Canadian sales representatives of "How They Did It" in opening new accounts during the past year.

Reading left to right:——*Back Row:* John A LaRose, Marc Archambault, William A Sharpe, Arthur Bourke, Edward Orzech, Robert W Harvey, Michael J Stasko, Alvin J Best, Gordon Bennett. *Middle Row:* Kjell Talgoy, Peter Lake, Charles Westover, George L Trubin, Gerald W Burgoyne, Gerald F Wright, Lionel R Binmore, Arthur R Meredith, Bill Soderlund. *Seated:* Don Staunton, Bob Bintz, Norman Riley, Ernest Hofmann, Don Pascal, A B Meredith, Berk V Schaub.

• International Nickel Official Reviews Corrosion Activities in U S

A comprehensive review of corrosion activities in the United States was given by F L LaQue, vice president of The International Nickel Company, Inc, and manager of its Development and Research Division in New York, at a meeting of the Society of Chemical Industry in London last month. A distinguished authority on corrosion, Mr LaQue, was presenting the Society's Corrosion Group Spring Lecture for 1955.

Mr LaQue traced the history of several technical groups in the United States that deal with corrosion to a major extent, and he also reported on the results of a recent survey of education in corrosion in American engineering schools.

After the lecture a colored sound motion picture covering activities at International Nickel's "Kure Beach" Corrosion Testing Station near Wilmington, N C, was shown. This station embraces facilities for exposure of specimens to sea air at Kure Beach and salt water at neighboring Harbor Island.

• 125 Scholarships Available at LTI

Martin J Lydon, president of Lowell Technological Institute, has announced that approximately 125 scholarships valued at $51,000 are available for the next academic year, starting in September.

Besides the general scholarships made possible through the Commonwealth of Massachusetts and the City of Lowell, and those administered by the LTI Alumni Association, specific industries continue to offer grants to students enrolled in textile, leather, and paper engineering courses. Departmental, state, and city scholarships are numerous for undergraduate students.

The Celanese Corporation of America offers a fellowship for graduate study at LTI in the fields of textile chemistry and textile engineering. This fellowship pays $1500 per year plus tuition and fees. Application may be made to the director of the Graduate School at Lowell Technological Institute, 1 Textile Avenue, Lowell, Mass.

Scholarships available to freshmen and upperclassmen in textile chemistry, textile engineering, or textile manufacturing courses include the Berkshire Fine Spinning Associates, Inc scholarship; the Russell L Brown scholarship donated by the Davis and Furber Machine Company; the Caron Spinning Company scholarship; the Mohawk Carpet Mills textile scholarship; the New England Textile Foundation undergraduate scholarships, the Pacific Mills Worsted Division Overseers Association scholarships; the Sylvan I Stroock scholarship, S Stroock & Co, Inc; the United Elastic Corporation scholarships; and the Jacob Ziskind Memorial scholarship.

Textile scholarships available for upperclassmen only are the Arthur Besse memorial scholarship; the Fiberglas scholarships donated by the Owens-Corning Fiberglas Corporation; the Gehring Foundation memorial scholarship; the Ralph E Hale scholarship established by the Northern New England Section of the American Association of Textile Chemists and Colorists; and the Interchemical Corporation scholarships.

Application for all undergraduate scholarships may be made to the dean of students at LTI.

NEW PRODUCTS AND DEVELOPMENTS

• Varicolored Leather Garments Loom as New Dye Process is Disclosed

An announcement made earlier this month by the Leather Industries of America suggests that, for the first time, leather in full, bright, and attractive colors may now be washed in laundry equipment, alongside textile fabrics, without fear of staining or loss of color. Possible combinations of leather and textiles, not hitherto feasible, are also suggested.

The new development, which involves improved tanning procedures and coloring processes, had its origin in late 1951 and stemmed from a visit of George H Meyer of Liberty Dressing Co, representing the Fulton County (N Y) Glove Tanners Association, to the New York office of General Dyestuff Co. Mr Meyer consulted with J S Kirk, head of GDC's leather laboratory in Rensselaer, N Y, who with his staff is given credit for the final development.

Mr Meyer asked Dr Kirk if his company was willing to devote time and effort to the problem of fast-to-washing colors for glove leather. It was necessary, stressed Mr Meyer, to have the colors sufficiently fast and adequate in range so that combinations of colored leather and textiles could be made without fear of bleeding when laundered. It was decided that a limited research program would be set up. Mr Meyer agreed to supply the leather and investigate the tanning procedures necessary for wash-fast leather. Thus began a long series of tests on tanning and on coloring.

When a dyeing procedure looked sufficiently attractive in the laboratory, it was transferred to a small-scale test involving three to twelve skins, sufficient to permit a comprehensive evaluation. In all, more than thirty dozen skins were used for the initial trials. New tannages and new methods of fatliquoring were investigated, and the recognized fast dyes, such as vats, sulfur colors, and azoic or coupled colors, were tried. Experts in each field of coloring were consulted and new methods of application of color developed.

About a year and a half ago the tests are said to have indicated a really fast-color process had been developed. It remained to make successively larger and larger lots of leather, to test the reproducibility, to find out whether the process was adaptable to full-scale operation, and above all to submit the leather to impartial testing laboratories for unbiased reports. Among hundreds of laboratory tests, many combinations of colors failed, a few survived, and from these, new methods and combinations were devised. By this process of elimination and development a whole range of new, bright and fast colors emerged.

To the GDC chemists and to the tanners in Gloversville the climax came when red, green, brown, and blue leather gloves were tossed in a home laundry machine and washed in soap. "To see this done without a trace of bleed, but best of all to see the gloves after washing full of bright color and of unharmed leather was a real thrill," said executives of the two organizations.

• Aluminum Formate in Solid Form

Aceto Chemical Co, Inc, Flushing 54, N Y, has announced the availability of aluminum formate in crystalline form, a high-quality product containing 30% equivalent alumina content. It is said to be completely free of aluminum chloride and sodium sulfate.

Aluminum formate is used in the textile field as a water repellent for fabrics, in leather tanning, in dyeing and in the treatment of natural or synthetic fibers.

A new technical bulletin is available from Aceto on request.

• Kalex CUL

The Hart Products Corp, 1440 Broadway, New York, N Y, has announced the development of a new sequestering agent which is said to have powerful ferric-iron chelating power in addition to potent alkaline-earth chelating action.

Kalex CUL reportedly shows the following activity in grams of ion sequestered per gram of sequestrant (on 100% solids basis):

nickel	0.23
cobalt	0.26
zinc	0.28
copper	0.25
ferric iron pH = 5	0.38
ferric iron pH = 7	0.38
ferric iron pH = 9	0.41
ferric iron pH = 11	0.45
calcium	0.082

NAMES IN THE NEWS

FRANK J SODAY, president of the Southern Association of Science and Industry, has been selected as the 1955 Herty Medal Winner for his outstanding contribution to the field of chemistry in the South.

Dr Soday is vice president and director of research and development for The Chemstrand Corporation. He holds over 130 U S patents, principally in the field of petrochemicals.

The medal, the twenty-second such award, will be presented to Dr Soday at a special meeting to be conducted by the Georgia ACS section at Millidgeville, Ga, on May 7th.

The purpose of the award is to give public recognition to the work and service of outstanding chemists who have contributed to their chosen field. An additional purpose of the award is to honor Charles H Herty, who pioneered the development of the paper industry in the Georgia area. Dr Herty also contributed greatly to the national chemical scene as editor of the Industrial Journal of the American Chemical Society *and as president of the American Chemical Society.*

The medal is given by the Chemistry Club of Georgia State College for Women and awarded by the Georgia ACS section.

ROBERT L FOSBURG has been named senior sales representative in the New England area for the Michigan Alkali Division, Wyandotte Chemicals Corporation. The appointment became effective April 1. Mr Fosburg, who was formerly sales representative in the Philadelphia territory, will work out of Wyandotte's Eastern District Office in New York.

Antistatic specialty products will be the subject of an address by RICHARD D FINE, an industry manager in Atlas Powder Company's Chemicals Department, at the spring meeting of the Chemical Specialty Manufacturer's Association. The meeting will be held at the Drake Hotel, Chicago, May 15 to 17, with Mr Fine speaking on May 17.

His talk will cover the types of materials now available for compounding, and methods of formulation and testing.

Becco Chemical Division, Food Machinery and Chemical Corporation, Buffalo, N Y, has announced the appointment of BERNARD K EASTON as manager, Textile Research and Development Department.

Mr Easton has served as supervisor of Becco's Textile Division since 1953.

Soday

Fosburg

Jackson

WILLIAM E JACKSON has resigned his post as plant superintendent with Greenville Finishing Co to return to the Peterborough Division of Verney Corp, W Peterborough, N H, as plant manager in charge of dyeing and finishing menswear marquisettes. Mr Jackson had served as works manager at Peterborough from 1952-4.

HAROLD W WHITCOMB, president and a director of Fieldcrest Mills, Inc, Spray, N C, will be honored by the North Carolina State College Chapter of Phi Psi Fraternity on May 6 as the "Man of the Year". Mr Whitcomb was similarly honored in 1954 by the Leaksville-Spray Exchange Club.

WALTER E ESKEW has joined Blackman-Uhler Co, Spartanburg, S C, as technical director. During the past nine years Mr Eskew was an officer of the Piedmont Chemical Corp, Charlotte, N C, and he also has acted as a technical consultant to Blackman-Uhler.

In addition to his new post, Mr Eskew will act as technical director for the Blackman-Uhler Mfg Co, which recently started operations in its new plant at Camp Croft, S C.

Blackman-Uhler Co, together with Blackman-Uhler Mfg Co, Alliance Color & Chemical Co, and Alliance Chemical Corp are divisions of The Andover Co.

B L HATHORNE, formerly with Glyco Products, Inc, has joined the Synthetics Division of J P Stevens & Co, Inc.

Mr Hathorne will be located at Greensboro, N C, where he will be engaged in technical research on synthetic yarns.

GENERAL CALENDAR OF COMING EVENTS

AMERICAN SOCIETY FOR TESTING MATERIALS

58th Annual Meeting—June 26-July 1, Chalfonte-Haddon Hall, Atlantic City, N J.

CANADIAN ASSOCIATION OF TEXTILE COLOURISTS & CHEMISTS (Quebec Section)

June 18 (Annual Golf Tournament).

DELTA KAPPA PHI FRATERNITY

1955 Annual Convention—April 29-30, Lowell, Mass.

DEUTSCHE GESELLSCHAFT FUR CHEMISCHES APPARATEWESEN

Achema XI—May 14-22, Frankfurt am Main, Germany.

DRYSALTERS CLUB OF NEW ENGLAND

Apr 29 (Hotel Vendome, Boston, Mass); June 24 (Outing—Wachusett Country Club, W Boylston, Mass).

THE FIBER SOCIETY

Spring Meeting—May 4-5, 1955, Alabama Polytechnic Institute, Auburn, Alabama.

Fall Meeting—Sept 8-9, 1955, Massachusetts Institute of Technology, Cambridge, Mass.

INTERNATIONAL TEXTILE EXHIBITION

2nd Exhibition—June 25-July 10, 1955, Brussels, Belgium.

INTERNATIONAL WOOL TEXTILE RESEARCH CONFERENCE

September, 1955—Sydney, Melbourne, and Geelong, Australia.

NATIONAL ASSOCIATION OF HOSIERY MANUFACTURERS, KNITTED OUTERWEAR ASSOCIATION, THE UNDERWEAR INSTITUTE

42nd Knitting Arts Exhibition—April 25-29, Convention Hall, Atlantic City, N J.

NATIONAL COTTON COUNCIL OF AMERICA

1955 Chemical Finishing Conference—Sept 20-21, Chalfonte-Haddon Hall, Atlantic City, N J.

PURDUE INDUSTRIAL WASTE CONFERENCE

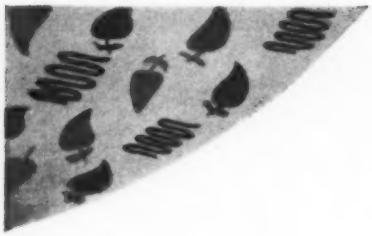
10th Conference—May 9-11, Purdue University, Lafayette, Ind.

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION

May 11, Sept 14, Oct 11, Nov 9 (Hotel Commodore, New York, N Y); June 9-11 (Outing——The Greenbrier, White Sulfur Springs, W Va).

TAPPI (Metropolitan District)

May 10 (Fraunces Tavern, New York).



DESIZING UNIFORMITY

TIME AFTER TIME WITH

RHOZYME LA*

RHOZYME LA is the most dependable desizing enzyme now available to the textile industry.

RHOZYME LA has consistent high quality, is stable in storage, and also exhibits unusual heat resistance in high-speed, high-temperature operations.

For the full story on this low cost, highly efficient agent, write for our technical bulletin.

* **RHOZYME LA** *is another dependable chemical product for the textile industry made by the makers of* LYKOPON.

RHOZYME *and* LYKOPON *are trade-marks, Reg. U.S. Pat. Off. and in principal foreign countries.*

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

PENETRANTS • DETERGENTS • SOFTENERS • REPELLENTS • FINISHES

BURK-SCHIER

BURKART-SCHIER CHEMICAL CO., CHATTANOOGA, TENN.

CLASSIFIED ADVERTISEMENTS

Advertisements in this section are restricted to HELP WANTED—POSITIONS WANTED—EQUIPMENT wanted or for sale. Rates, effective February 1, 1954: One-time, $10.00 per column inch; 3 consecutive times (same copy), $9.00 per column inch; 13 or more times, $8.00 per column inch; Position Wanted, $2.00 per column inch. Figure 38 average words per column inch. Publisher reserves the right to reject or discontinue any classified advertisement. Replies should be addressed: Box Number .., c/o American Dyestuff Reporter, 44 East 23rd Street, New York 10, N. Y.

ABSTRACTING SERVICE—Abstracting and digesting of foreign patents and periodicals. Literature review and special reports in dyestuff and cellulose chemistry. PAUL WENGRAF, 88-36 ELMHURST AVENUE, ELMHURST 73, NEW YORK.

CONFIDENTIAL EMPLOYMENT SERVICE

If you are available for a good position in textiles, it will pay you to have your application in our files. Negotiations are confidential through us.

CHARLES P. RAYMOND SERVICE, Inc.
Phone: LIberty 2-6547
294 Washington St., Boston 8, Mass.
Over 55 Years In Business

INTERIOR DECORATION—HOME STUDY ANNOUNCING NEW HOME STUDY COURSE in Interior Decoration. For professional or personal use. Fine field for men and women. Practical basic training. Approved supervised method. Low tuition. Easy payments. Free Booklet. Chicago School of Interior Decoration, 835 Diversey Parkway, Dept. 2755, Chicago 14, Ill.

POSITION WANTED: Superintendent-Finisher, over 20 years' experience in jig plant finishing on piece goods —rayons, acetates, (twills, taffetas, satins) nylon taffetas, dacron piques, rayon and cotton bengalines, durable water repel and resin type residual finishes fully known. Write Box No. 870.

WANTED: DYESTUFF SALESMAN. Top manufacturer of dyestuffs requires qualified man for established mid-west territory. Excellent opportunity. Give complete background in first letter. Write Box No. 880.

POSITION WANTED: PLANT MANAGER, more than 15 years' experience all phases of textile production, including quality control, methods and coordination of engineering, research and manufacturing. Cost conscious, excellent administrator. College graduate, with textile technical training. Age 39. Seeks real challenge. Write Box No. 877.

POSITION WANTED: Textile Chemist and Colorist for technical service. Extensive experience in all branches of textile processing. Thoroughly familiar with the detailed application of dyes, pigments, chemicals and finishes. Write Box No. 875.

POSITION WANTED: Technical graduate with wide experience in supervising complete textile printing operations. Thoroughly familiar with modern methods and machines used in both roller and screen printing, dyeing and finishing. Write Box No. 872.

POSITION WANTED: Production Manager, Colorist, Supervisor, in textile screen printing or allied fields. Customer liaison and business experience. Cost conscious. Will relocate. Write Box No. 876.

WANTED: Physicist or Physical Chemist, 3 to 5 years' experience in colorimetry and spectrometry. To develop methods and direct spectrophotometric analyses of dyestuffs, pigments and textile materials, and to interpret results for use in solution of research problems. This is a permanent position in Celanese's modern research laboratory in Summit, New Jersey, a pleasant residential community within 30 miles of New York City. Please write complete details, including salary desired, to—J. A. Berg, Celanese Corporation of America, Summit, N. J.

CLASSIFIED ADVERTISEMENTS

WANTED: SALESMAN with following: Synthetic resins and detergents, wetting agents, repellents. New England. Right man will draw $600 to $1,000 month and car. Commissions. Reply in detail. Write Box No. 882.

POSITION WANTED: TEXTILE CHEMIST AND COLORIST. Director of dyestuff application laboratory. Expert in standardizing, color matching and testing of all classes of dyes on all fibers, dyeing and printing. Considerable experience in technical sales and administrative work. Seeks responsible position. Will consider sales. Write Box No. 883.

POSITION WANTED: JIG DYER, 25 years' experience, directs, acetates, nylon and blends. South preferred. Write Box No. 884.

WANTED: Chemist, Textile School graduate preferred. Must be experienced in lab and plant on synthetic piece goods for responsible position in New Jersey dyehouse. Write Box No. 885.

TEXTILE CHEMIST WANTED: For a Connecticut Lace Manufacturer. Experienced in setting up laboratory standardization and testing of all yarns and synthetics. Experience in dyeing and resin finishing laces and elastic goods helpful. Excellent opportunity for young man with ability. Write Box No. 886.

WANTED: Textile Chemist or Assistant Textile Chemist. Must be experienced in dye laboratory for dyestuff application and testing. Northern New Jersey. Write Box No. 888.

MALE: Sales Development Chemist—Textile Finishing—Must have a strong chemical background with considerable experience in the finishing of common textile products, especially piece goods. Duties include mainly field testing and evaluation of new chemical textile finishing products and some market research. Will act as liaison between research and sales department in development of initial sales and customer servicing of new products. Prefer man 30 to 40, willing to travel. Salary commensurate with qualifications. Location—Mid Atlantic States. Reply in full to Box No. 889.

SALES—Long established Philadelphia Co. desires textile institute or equivalent graduate with experience in textile chemicals for sales promotion work within 100 mile radius. Must have strong sales aptitude. Age 28-40. Salary followed by commission. Reply in detail to Box No. 890.

WANTED: Young man to assist in small dyehouse handling silk and nylon skeins. Good opportunity for advancement, pleasant working conditions. Plant located in Bronx, New York. Remington Manufacturing Co., 2082 Boston Road, Bronx, N. Y.

POSITION WANTED: Quality and production control manager for commission dyeing plant or for multi-plant corporation. Experienced in all types blends and processing. Write Box No. 887.

POSITION WANTED: Textile-Chemist, capable of taking charge of research, development, plant control in the manufacture of textile chemicals and auxiliaries. Familiar with service problems in the textile and allied industries, desires connection with a progressive organization. Greater New York, Philadelphia and vicinity preferred. Write Box No. 871.

WANTED: Ambitious chemical or textile chemical graduate with experience in cotton and rayon finishing; particularly with various types of resin finishing. The work consists of sales and demonstration with southern manufacturer or synthetic chemicals and textile resins. Excellent opportunity for advancement with a growing concern. Please give complete background. Write Box No. 895.

Try

A

Classified

PERMANENT AGELESS DURABLE

"Duro-Tex" Stainless Batch Cans

SEAMLESS WELDED — POLISHED

Cap. Gal.	Dia. In.	Height In.	Each
10	13¼	18	$36.30
15	15¾	18	46.20
20	16	24	52.80
25	18	24	62.70
30	20	24	69.30
40	22¾	24	79.20
50	22¾	30	90.75
75	28	30	105.60

SPECIFICATIONS: Type 304 Stainless Steel, heavy gauge and polished, all-welded and blended on the inside, with inside bottom corner rounded. Aluminized handles and steel rings around top edge and bottom edge. Top edge curled and wired. Bottom ring tackwelded to can.

Seamless Stainless Steel Dyehouse Ware. Ask for Price List.

READING SCIENTIFIC COMPANY
13th & Pike Streets Reading, Penna.

RESEARCH OPPORTUNITY

for

TEXTILE CHEMIST or ENGINEER

New, attractive position has developed in our expanding textile research program for a young man with several years experience in the chemical finishing of textiles or textile manufacturing. Starting salary commensurate to the individual's capabilities. This position offers excellent advancement opportunities in a leading, progressive, industrial research organization. We invite you to submit a resume of your qualifications for prompt, confidential considerations to

The Personnel Manager

BATTELLE MEMORIAL INSTITUTE

505 King Avenue Columbus 1, Ohio

NOW AVAILABLE!

NEW BINDER TO HOLD YOUR

AMERICAN DYESTUFF REPORTER COPIES

EVERY issue is held securely by flat steel blades. There is a label holder on the backbone to use for dating the volumes. Holds 26 issues. It opens flat for easy reference. Maroon leatherette with the title AMERICAN DYESTUFF REPORTER in gold leaf. It looks and handles like the finest book in your library.

Only $3.50 postpaid.

Please send check with order to:

American Dyestuff Reporter

44 East 23rd Street, New York 10, N. Y.

It will *pay you* to investigate . . .

DYEFIX — C CONC AND 105

to improve fastness properties of

- DIRECT TURQUOISE
- SULPHUR GREEN
- DEVELOPED RED

and many other selected colors . . .

Both products are liquid and may be applied at room temperature in all types of dyeing and wet finishing equipment.

samples on request . . .

Sou-Tex Chemical Company

MOUNT HOLLY • NORTH CAROLINA

BIXAMINE FAST RED 6BLL

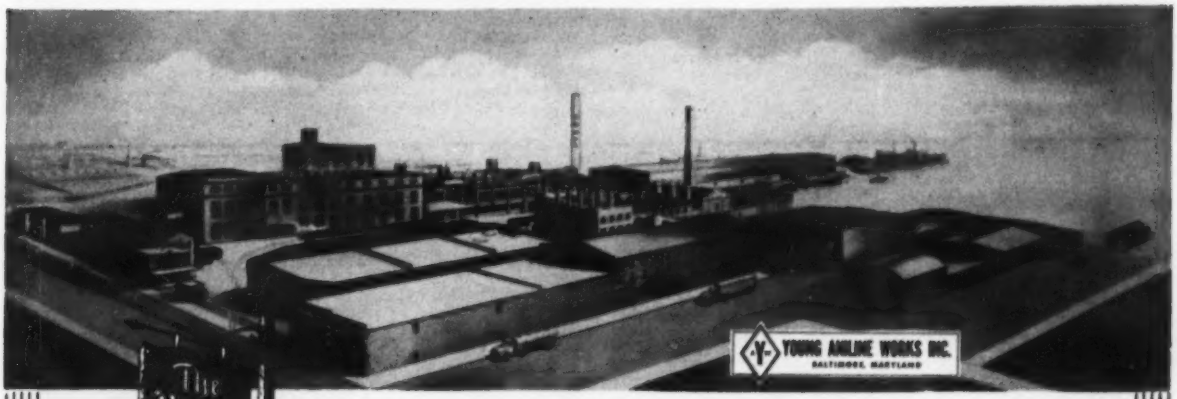
A direct cotton and rayon dye of outstanding fastness to light

- **Easy to apply**
- **Level dyeing**
- **Acetate effects remain white**
- **Fast to dry cleaning**

Write for sample and shade card

BICK & CO., INC.

READING, PENNA.



The House of Blacks

ACID BLACKS • DIRECT BLACKS
ACETATE BLACKS • LOGWOOD BLACKS
FORMALIDE BLACKS • DEVELOPED BLACKS

Consult your local dyestuff distributors for information and samples. Shipments can be made from their convenient stocks or from our Baltimore or Paterson warehouses.

YOUNG ANILINE WORKS, INC.

OFFICE AND FACTORY

2701-2733 Boston St., Baltimore 24, Md.

fatty acids

for the textile industry

Century Brand Fatty Acids have been custom-tailored to meet the varying requirements of progressive textile processors.

Century 1405 (Distilled Animal Fatty Acid) has a light color, is odor-free, makes an excellent lubricant, and can be readily sulfated.

Century 1005 (Low Titre Distilled Oleic Acid) is easily saponified to yield an efficient, easy rinsing, sodium soap.

Century 1030 (Low Titre Double Distilled White Oleic Acid) is free from odor, discoloration and rancidity; it finds wide acceptance in emulsifiers and specialty soaps.

Century 1220 (Double Pressed Stearic Acid) is used to make cationic softeners; it gives added permanency to softening effects on cotton and rayon.

Century Hydrex 460 (Hydrogenated Fatty Acid) — Its low Iodine Value insures stability, prevents gumming and hardening when used in size softeners. Readily removable in scouring operation.

Samples and technical data available on the above products. These are but a few of the many Century Products designed for use in textile processing.

Write for a copy of our catalog today.

HARCHEM DIVISION
WALLACE & TIERNAN INC.
Successors to W. C. Hardesty Co., Inc.
25 MAIN STREET, BELLEVILLE 9, N. J.
FACTORY: Dover, Ohio. IN CANADA: W. C. HARDESTY CO. OF CANADA, LTD., TORONTO

● INDEX TO ADVERTISERS ●

Alco Oil & Chemical Corp.	
Alliance Color & Chemical Corp.	19A
Althouse Chemical Co., Inc.	29A
Amalgamated Chemical Corp.	
American Aniline Products, Inc.	3A
American Cyanamid Co. (Dyestuff Dept.)	
American Cyanamid Co. (Tex. Resin Dept.)	
American Dyestuff Reporter	
American Hard Rubber Co.	
American Viscose Corp.	
Anders Chemical Co.	
Antara Chemical Division of General Dyestuff Co.	
Apex Chemical Co., Inc.	
Arkansas Company, The	
Armour & Co.	
Arnold Hoffman & Co., Inc.	
Atlantic Chemical Corp.	
Atlantic Refining Co., The	
Atlas Electric Devices Co.	
Aula Chemicals, Inc.	
Augusta Chemical Co.	25A
Barium Reduction Corp.	
Becco Chemical Div.	
Food Machinery & Chemical Corp.	23A
Berkshire Color and Chemical Co.	7A
Bick & Co., Inc.	39A
Bryant Chemical Corp.	71A
Burkart Schier Chemical Co., Inc.	36A
Burlington Engineering Co., Inc.	
Butterworth & Sons Co., H. W.	42A
Calgon, Inc.	
Campbell & Co., Inc., John	
Carbic-Moss Corp.	
Carbide & Carbon Chemicals Co., A Division of Union Carbide and Carbon Corp.	
Charlotte Chemical Laboratories, Inc.	
Ciba Company, Inc.	12A, 13A, 14A
Colgate-Palmolive Company	
Columbia-Southern Chemical Corp.	
Cravenette Co., The	4A
Custom Scientific Instruments	
Demco Chemical Co.	
De Paul Chemical Co.	
Desert Sunshine Exposure Tests	
Dexter Chemical Corp.	Third Cover
Drew & Co., Inc., E. F.	
Du Pont de Nemours & Co., (Inc.), E. I.	
Dyes and Chemical Divisions	
Electrochemicals Dept.	
Organic Chemicals Auxiliaries	
Eastman Chemicals Products, Inc.	
Emery Industries, Inc.	
Emkay Chemicals Co.	
Fablok Mills, Inc.	
Fancourt & Co., W. F.	
Feeley Co., E. I.	
Foxboro Co., The	8A
Gabb Special Products	
Gaston County Dyeing Machine Co.	
Geigy Company, Inc.	Front Cover
General Dyestuff Co.	5A
General Electric Co.	
Goodrich Chemical Company, B. F.	
Goodyear Tire & Rubber Co.	
Gurley, W. & L. E.	
Harchem Div., Wallace & Tiernan, Inc.	40A
Hart Products Corp., The	
Hercules Powder Co.	32A
Hermas Machine Co.	
Heyden Chemical Corp.	
Hilton-Davis Chemical Co., The	
Haughton & Co., E. F.	
Hubinger & Co., The	
Imperial Paper & Color Corp.	17A
Interchemical Corp., Textile Colors Div.	
International Salt Co., Inc.	
Jersey State Chemical Co.	

INDEX TO ADVERTISERS

Kali Mfg. Co.
Kelco Co. 30A
Klauder Weldon Giles Machine Co.

Laurel Soap Mfg. Co., The
Le Conte & Co., Inc.
Leatex Chemical Co.

Mathieson Chemicals, Olin Mathieson Chemicals Corp. 18A
May, Inc., Otto B.
Metalsmith Div., Orange Roller Bearing Co., Inc.
Metro-Atlantic Co., Inc.
Minneapolis-Honeywell Regulator Co., Industrial Div. 24A
Monsanto Chemical Co. 27A
Morningstar Nicol, Inc. 22A
Morton Salt Co. 16A
Mutual Chemical Co. of America

National Aniline Division, Allied Chemicals & Dye Corp. 7A, 34A
National Milling & Chemical Co.
National Starch Products
Naugatuck Chemical Div., of U. S. Rubber Co.
Nopco Chemical Corp.
Nova Chemical Corp.
Nyanza Color & Chemical Co., Inc. 26A

Olin Mathieson Chemicals Corp.
Industrial Chemicals Div.
Onyx Oil & Chemicals Co. 15A
Oronite Chemical Co.

Pabst Sales Co. 41A
Pad Dye Corp.
Pennsylvania Salt Mfg. Co.
Perkins & Sons., Inc., B. F.
Pfister Chemical Works, Inc.
Pharma Chemical Corp.
Philadelphia Quartz Co.
Photovolt Corp.
Pittsburgh Coke & Chemical Co.
Procter & Gamble

Reading Scientific Co. 38A
Refined Products Co. Second Cover
Rohm & Haas Co. 35A
Royce Chemical Co. Back Cover
Rumford Chemical Works

Sandoz Chemical Works, Inc.
Scholler Bros, Inc.
Seydel-Wooley & Co.
Sherwin-Williams Co.
Sims Metal Works
Sirrine Co., J. E.
Smith, Drum & Company
Solvay Process Division, Allied Chemical & Dye Corp. 31A
Sou-Tex Chemical Co. 38A
Standard Brands, Inc.
Standard Chemical Products, Inc. 9A
Stein Hall
Swift & Company

Taylor Instrument Companies
Tennessee Corporation
Tex-Chem Co.
Tinolan Co. of America, Inc.

Union Carbide & Carbon Corp.
Carbide & Chemicals Co.
U. S. Rubber Co., Naugatuck Div.

Van Vlaanderen Machine Co.
Verona Dyestuffs 28A
Versenes, Inc.
Victor Chemicals
Virginia Smelting Co.

Wallerstein Co., Inc.
Warwick Chemical Co.
Westvaco Chem. Div., Food Machinery & Chemical Corp.
Wica Chemicals, Inc. 11A
Wiesner-Rapp Co., Inc., The 21A
Wolf & Co., Jacques
Wyandotte Chemicals Corp.

Young Aniline Works, Inc. 39A

Zinsser & Co., Inc.

a Desizing Agent should be...

☆ EASY TO USE

☆ ECONOMICAL

☆ SAFE ON ALL FABRICS

☆ A QUICK AND COMPLETE STARCH DIGESTER

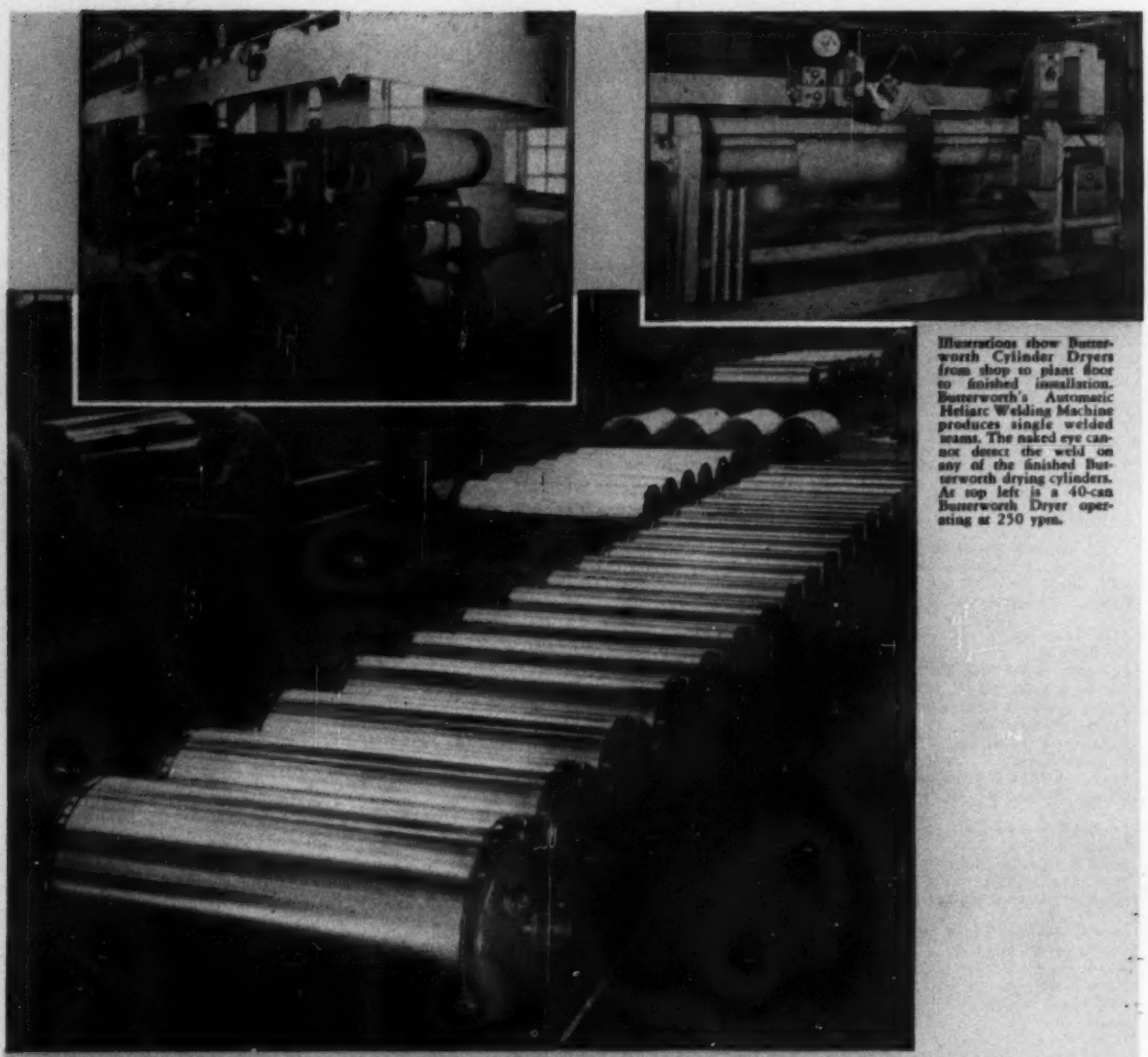
☆ DEPENDABLE

(EXSIZE-T MEETS ALL OF THESE REQUIREMENTS)

Desize with EXSIZE-T

Copyright 1955
PABST BREWING COMPANY
Industrial Products Division
221 N. La Salle St., Chicago, Ill.

T.M. Reg. U.S. Pat. Off.



Illustrations show Butterworth Cylinder Dryers from shop to plant floor to finished installation. Butterworth's Automatic Heliarc Welding Machine produces single welded seams. The naked eye cannot detect the weld on any of the finished Butterworth drying cylinders. At top left is a 40-can Butterworth Dryer operating at 250 ypm.

Smoother Cylinders . . . Better Dryers

Here's seam-welding so precise you can't see the seam on the finished cylinder.

A switch is snapped and a cylinder is welded in one slow, steady, precise movement. With this automatic welding machine, error hasn't got a chance.

It takes superior equipment to produce superior products — this is a manufacturing philosophy that Butterworth puts into practice. It's why Butterworth cylinders are smoother and stronger than ever before. And it's why Butterworth can give you fine machinery at a competitive price.

Butterworth drying equipment is engineered to meet your specific requirements, such as weight of cloth, width of cylinder, moisture content and dryness desired. You can specify coded or uncoded, copper or stainless steel cylinders; vertical or horizontal arrangement; fabricated or cast-iron columns; gear, sprocket-and-chain or V-belt drive. Whether your problem calls for cylinders, a complete machine — or a special finishing range that requires complete cooperation between machine-builder and your own engineering staff — talk to a Butterworth man. Write us today.

H. W. BUTTERWORTH & SONS CO.
Bethayres, Pennsylvania

1211 Johnston Building, Charlotte, N. C.
187 Westminster Street, Providence, R. I.

Representatives in Principal Cities of the World

Machines for Bleaching, Boiling-Out, Dyeing, Mercerizing, Finishing & Embossing
Pot Spinning Machines for Synthetic Fibers
Calender Rolls : : Tenter Chains

BUTTERWORTH

The Modern Cotton Softener

Dexene 77 is the newest, the most advanced way to put softness back into cotton. With Dexene 77, cotton never had it so soft!

Gives full-bodied, rich softness to cotton fibers.
Resists oxidation and rancidity.
Has excellent moisture retaining qualities.
Has no effect on light fastness of dyes.
Does not produce tackiness or mark-off.
Facilitates high-speed sewing and cutting.
Highly economical—only a small percentage is necessary to obtain an excellent hand.

your touch tells you . . . DEXENE 77*

dexter

Textile Chemicals

* TRADEMARK

TEXTILE CHEMICAL DIVISION OF DEXTER CHEMICAL CORP. [illegible] N. Y.
Boston • Charlotte • Atlanta • Chicago • Boston [illegible]

Everyone has different ideas

...about desizing agents

POWDERED?
LIQUID?
POWDERED HIGH TEMPERATURE?
CONCENTRATE?
LIQUID CONCENTRATE?
No matter what your preference, you're sure to find your choice, for the best desizing agents are NEOZYMES by Royce.

NEOZYME®: a rapid-acting, water-soluble white powder for heat-saving low temperature desizing at 120° to 125°F. Outstanding money value . . . 1 pound equals 8 pounds of liquid enzyme—*cuts your storage space 87½%.*

NEOZYME HT: a concentrated white powder for high speed desizing at high temperatures. Completely water soluble. Needs no salt for activation. Retains potency *longer* than other enzymatic desizers.

NEOZYME Special: in a standardized, starch desizer. A fast-acting liquid of proven superior heat stability at 160° F—better than other liquid commercial enzymes.

NEOZYME L Conc.: a concentrated high-quality starch liquefying enzyme of exceptional heat stability at 160°F. Economical—saves in handling and storage.

You buy the best when you specify a desizing agent by Royce—guaranteed controlled quality. Rigid laboratory control eliminates costly reprocessing caused by use of non-uniform products. And behind all Royce products stands the Royce Technical Service, backed by years of practical textile experience. Desizing problems? Let Royce solve them for you. Write for additional information and data sheets.

Royce

ROYCE CHEMICAL CO.

CHEMICAL COMPANY • CARLTON HILL, NEW JERSEY

Manufacturers of Chemicals for the Textile Industry

7010